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RAPID CREEK FLOOD HAZARD ANALYSES

Bannock County, Idaho



UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
BOISE, IDAHO

In cooperation with:

BANNOCK COUNTY
IDAHO DEPARTMENT OF WATER ADMINISTRATION
SOUTHEAST IDAHO COUNCIL OF GOVERNMENTS
PORTNEUF SOIL AND WATER CONSERVATION DISTRICT

June 1974

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RAPID CREEK

Flood Hazard Analyses **(Including Inman Creek** **and** **West Fork Creek Tributaries)** **Bannock County, Idaho**

NOV 18 1974

Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
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Front Cover Photo Courtesy of Idaho State Journal

June 1974

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RAPID CREEK
Flood Hazard Analyses
(Including Inman Creek
and
West Fork Creek Tributaries)
Bannock County, Idaho

INTRODUCTION

The Soil Conservation Service, USDA, prepared this report in response to a request to the Idaho Department of Water Administration by Bannock County Commissioners and in accordance with the joint USDA-State of Idaho Coordination Agreement.

Study Authority

Flood hazard analyses are carried out by the Soil Conservation Service as an outgrowth of the recommendations in A Report by the Task Force on Federal Flood Control Policy, House Document No. 465 (89th Congress; ordered printed August 10, 1966), especially recommendation 9(c), "Regulation of Land Use," which recommended the preparation of preliminary reports for guidance in areas where assistance is needed before a full flood-hazard information report can be prepared or when a full report is not scheduled.

The authority for funding flood hazard analyses is Section 6 of Public Law 83-566, the Watershed Protection and Flood Prevention Act, which authorizes USDA to cooperate with other federal and with state and local agencies to make investigations and surveys of the watersheds of rivers and other waterways as a basis for the development of coordinated programs.

In carrying out flood hazard analyses, SCS is responding to Executive Order 11296, dated August 10, 1966, especially to Section 1(4), which directs "all executive agencies responsible for programs which entail land use planning shall take flood hazards into account when evaluating plans and shall encourage land use appropriate to the degree of hazard involved."

USDA Secretary's Memorandums Nos. 1606 and 1607 (November 7, 1966), both dealing with the problem of managing flood losses, assigned to the Soil Conservation Service the leadership within the Department for implementing the applicable recommendations of House Document No. 465, as well as for representing the Department under Executive Order 11296.

In addition, Section 302 of the Rural Development Act of 1972 (Public Law 92-419) directs the Secretary of Agriculture to carry out flood plain identification under the National Land Inventory and Monitoring Program.

Funding

Funding of this study has come from Bannock County and from Federal sources under the above authorization through USDA-SCS appropriations for river basin surveys and investigations.

Initiating Action

This study was initiated by Bannock County Commissioners and endorsed by the Southeast Idaho Council of Governments. The Portneuf Soil and Water Conservation District concurred in the need for the study and requested the State Conservationist of the Soil Conservation Service to place a high priority on this assistance.

Reason for Study

Bannock County requested the study because of increasing flood damages to rural residences. Development is increasing in the rural areas by people unaware of the flood hazards. Problems being experienced have prompted the need for information to help them recognize and evaluate the risks of flooding.

The purpose of this study is to assist local residents and public officials in identifying the flood hazard areas, and to provide a basis for further study and planning of actions to prevent or minimize flood damages.

DESCRIPTION OF THE STUDY AREA

Location

The study area is located in southeastern Idaho and lies in the north central part of Bannock County about 13 miles east of the city of Pocatello.

Watershed Area and Topography

The Rapid Creek watershed area is approximately 58 square miles. It is bounded on the east by the Portneuf Range and on the west by the Pocatello Range of mountains. The watershed ranges in elevation from 8,120 feet above mean sea level to 4,520 feet at the mouth of the creek.

Rapid Creek flows in a general direction from north to south. It is tributary to the Portneuf River at river mile 31.6.

Watershed Land Use

Land use includes about 5,200 acres of forest located mainly along the upper west slopes of the Portneuf Range. There is approximately 24,000 acres of rangeland; which accounts for 65 percent of the total watershed area. Dry cropland along the foothill slopes takes up about 7,300 acres. A narrow area of about 500 acres of irrigated land lies along the lower reaches of Rapid Creek making up the remaining land area.

Settlement of the Area

The Rapid Creek area was originally part of the Fort Hall Indian Reservation and was opened to settlement in 1902. Prior to this date, the area was grazed by cattle that wintered on the Fort Hall bottomlands. This area served as an interim grazing area as cattle were driven to the summer range near Chesterfield.

Farming began immediately after 1902 and the greatest period of settlement occurred between 1902 and 1920. The townsite of Inkom, located at the mouth of Rapid Creek, was laid out in 1912.

GENERAL FLOOD CONDITIONS AND FLOOD HISTORY

Causes of Flooding

The low pressure disturbances carrying moisture at relatively high levels across Nevada and Utah is the dominant weather pattern for this area during the warm season of June through August. The general air circulation pattern, carrying moist air, begins to curve northeastward as it approaches Idaho.

The mountain effects the moist air masses to produce more rainfall from Twin Falls eastward than in the valleys of southwestern Idaho.

Convective thunderstorms produced from the mechanisms of rising and cooling of moist air masses have been the predominant cause of flooding within the Rapid Creek drainage.

Flood runoff from winter storm and snowmelt over frozen soil has been a secondary cause of flooding. Spring snowmelt runoff, during April through June, has caused only minor flooding.

Flood Characteristics

Characteristics of the floods caused by the convective thunderstorms include high rates of flow and low volumes of water. Usually the floodwaters transport an appreciable amount of sediment and debris that often clog the bridge and culvert openings. The photo, Fig. 1, was taken of the July 20, 1973 flood. This shows debris and sediment deposited upstream from the culvert (refer to RC-20R, Plate 11) which is typical of floods experienced rather frequently.



Fig. 1 -- July 20, 1973 Flood
(SCS Photo)

Flood History

Only some of the more recent floods have been recorded or remembered by individuals living in the area. A list of these include:

<u>Summer Floods</u>		<u>Winter Floods</u>
August 23, 1951	May 31, 1963	February 1957
August 28, 1955	July 19, 1965	February 1962
August 15, 1957	July 20, 1972	February 1963
August 27, 1957	August 15, 1972	December 1964
August 13, 1961	July 20, 1973	
August 31, 1961		

Representative summer floods are described in the Idaho State Journal, a Pocatello newspaper, as follows:

August 23, 1951 -- "INKOM--In the wake of the worst flood in 40 years, Inkom residents were cleaning basements, airing clothes, and repairing fences late Wednesday afternoon while some nearby farmers still struggled with overturned farm equipment."

"County roads and bridges and Murl McNabb's farm, seven miles north of here on Rapid Creek, took the brunt of the raging flood waters that at times were six feet above the banks. . . . The flood demolished a barn, a machine shed and a milk shed, along with a five-bottom plow and a seed drill. Huge rocks and silt covered the bottomland in the vicinity of his farm."

August 28, 1955 -- "Flash floods poured down on Inkom and points from Inkom southward to Onyx Friday afternoon, ousting several families from their homes and strewing rocks and silt across roads."

"Rapid Creek swelled to more than a half-block wide and Indian Creek and others over ran their banks." (See photos Figs. 2 and 3)



Fig. 2 -- August 28, 1955 Flood
(Courtesy of the Idaho State Journal)



Fig. 3 -- August 28, 1955 Flood
(Courtesy of the Idaho State Journal)

SOURCES OF DATA USED

Maps and Aerial Photos

Recent mapping by the U.S. Geological Survey provided complete topographic map coverage of the watershed area. These maps consist of 7.5 minute series quadrangles, scale 1 to 24,000.

The aerial photos used in the study included eight-inch to the mile photos provided by Bannock County. The aerial photos used for the uncontrolled mosaic plan views on the accompanying sheets were taken from two-inch to the mile photos dated 1970.

Field Surveys and Measurements

Field surveys were made to acquire stream channel profiles for 9.7 miles on Rapid Creek, 3.0 miles on West Fork tributary and 0.6 of a mile on Inman Creek tributary. Surveys also included 81 valley cross-sections, 11 bridges, and 15 culvert road crossings along Rapid Creek; 18 valley cross sections, 2 bridge and 2 culvert road crossings on West Fork tributary; and 6 valley cross sections, and 1 culvert road crossing on Inman Creek tributary.

Flood History

Interviews, newspaper search and review of streamflow records for adjacent streams were sources used to compile the flood history.

Streamflow Data

Streamflow measurements available for Rapid Creek consist only of indirect peak flow measurements as follows:

<u>Date</u>	<u>Location</u>	<u>Peak Flow</u> (cfs)	<u>Drainage</u> <u>Area</u> (M ²)	<u>Information Source</u>
Feb. 11, 1962	Rapid Creek	300	54	Corps of Engineers
Feb. 1, 1963	Rapid Creek	526	57.2	U. S. G. S.
July 20, 1973	Inman Creek	120 <u>1/</u>	5.1	U. S. G. S.
Aug. 15, 1957	Rapid Creek	100	9	S. C. S.
Aug. 26, 1957	Rapid Creek	150	9	S. C. S.

1/ Preliminary estimates from U.S.G.S.

Other streamflow measurements used in the study are from nearby drainages that are considered somewhat similar to Rapid Creek. These include:

<u>Date</u>	<u>Location</u>	<u>Peak Flow</u> (cfs)	<u>Drainage</u> <u>Area</u> (M ²)	<u>Location Source</u>
Feb. 1, 1963	Fish Creek	1,360	20.1	U. S. G. S.
Feb. 1, 1963	Demsey Creek	400	42	U. S. G. S.
Aug. 1, 1960	Jenkins Canyon	2,350	5.5	U. S. G. S.
Aug. 12, 1961	Green Canyon trib.	3,060	2.82	U. S. G. S.
July 15, 1938	Birch Creek	95	6.56	U. S. G. S.
July 20, 1973	Sorrell Canyon	530 <u>1/</u>	2.5	U. S. G. S.
Aug. 3, 1960	Arkansas Canyon	5,700	14	S. C. S.
June 26, 1965	Arkansas Canyon	430	3.9	S. C. S.
June 26, 1965	Arkansas Canyon	485	5	S. C. S.
Aug. 16, 1968	Goodenough Creek	400	4	S. C. S.

1/ Preliminary estimates from U.S.G.S.

Hydraulic Analyses

Hydraulic studies included determining water surface profiles by use of the WSP2 computer program currently used by the Soil Conservation Service.

RESULTS AND CONCLUSIONS

Causes of Flooding

The predominant cause of flooding is the convective type of storm, particularly thunderstorms that usually occur during the June through August period.

Effects of Sediment and Debris

The effect of "bulking" from the sediment and debris was considered in estimating the peak flows. The effect upon reduction of capacity through the culverts and bridges is also represented in the flood profiles and consequent maps showing areas flooded.

Valley Flood Conveyance

The rather narrow floodplain valley provides an efficient conveyance system. The out-of-bank storage in the form of depressions, vegetation, etc. is less than usual which results in maintenance of higher flow rates. Once the low runoff-volume summer floods discharge into the Portneuf River the peak flow dissipates rapidly and often downstream areas along the Portneuf are hardly aware that flooding has occurred.

Effect of Future Land Changes

Future changes of land use is expected to include some additional rangeland being broken out and cultivated for dryland cropping. Cultivation, without special treatment and care, can increase the amount of runoff water and sediment. These changes were also considered in determining the peak flows and consequent flooding in this study.

Existing residential areas and those planned for development in the near future are not expected to have an appreciable effect upon runoff. These areas make up only about one percent of the total drainage area. There have been no development projection studies made and therefore, no basis for estimating their effects upon runoff.

Peak Flow Values

Peak flows were derived by transposition of streamflow data from areas outside the watershed. Available peak flow measurements for summer, winter and spring floods were evaluated using a method of regionalization. The study results, for selected recurrence intervals, are shown for the mouth of Rapid Creek, drainage area of 57.9 square miles:

<u>Recurrence Interval</u> (Yrs)	<u>Peak Flow</u> (cfs)
100	7,500
50	4,400
25	2,400

Areas Flooded and Accuracy of Prediction

Areas flooded for the 25-, 50-, and 100-year events for the study area are shown on plan-profile sheets, Plates 2 through 18. An index map showing the general area bounded by each of these plates is found on Plate 1.

The accuracy of prediction of areas flooded is dependent upon the nature of the floodplain and the effect of debris carried in the water. Flood lines at the mouth of most of the tributaries are difficult to define because of the alluvial fans. These areas are identified on the flood maps as high

hazard areas. In these areas it was not considered possible to determine, with sufficient accuracy, the flood lines of the three flood sizes.

Depths of Flooding

Figures 4, 5, and 6 are photos taken at selected locations to show the maximum stage which the 100-year flood would attain along Rapid Creek. The elevations of the maximum stage at other locations or for other frequencies can be determined from the flood profiles shown along with the flood hazard area maps on Plates 2 through 18.

Floodwater depths for the 100-, 50-, and 25-year floods are shown on Plates 19 and 20 for typical valley cross-sections. These valley cross-sections can be located in the study area by referring to the plan-profile sheets, Plates 2 through 18.



Fig. 4 -- Front of Evans Residence
Cross-section RC-70
(SCS Photo)

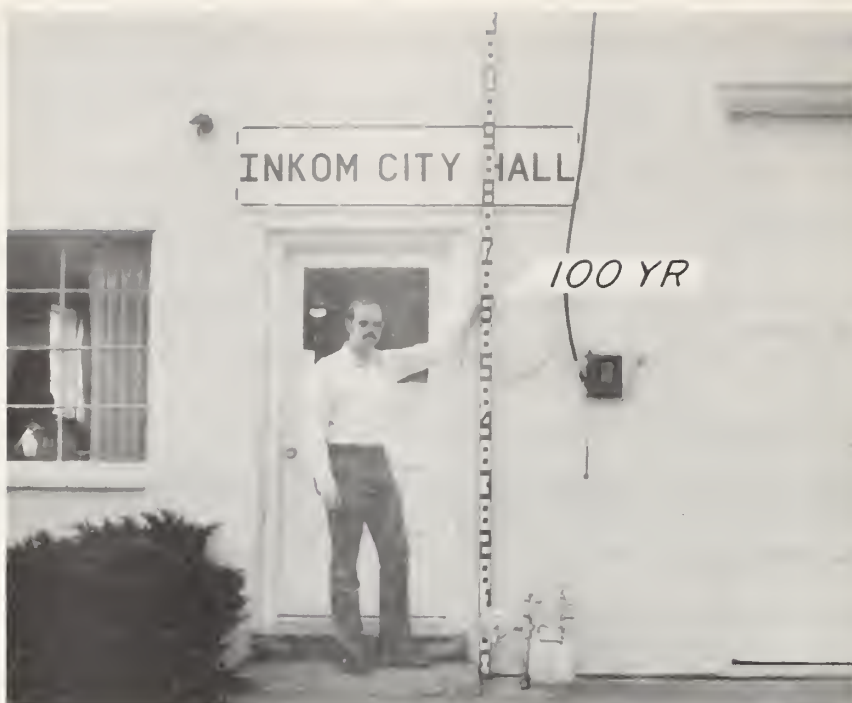


Fig. 5 -- Front of Inkom City Hall
Between Cross-sections RC-73 and RC-74
(SCS Photo)



Fig. 6 -- Rapid Creek Channel under Interstate Highway 15 Overpass
Cross-section RC-74
(SCS Photo)

INTERPRETATIONS AND RECOMMENDATIONS

Floodplain Land Use and Regulations

Land within the floodplain is currently used primarily for agricultural purposes. The town of Inkom occupies the main residential developed area on the floodplain.

Agriculture can continue to make effective use of the floodplain. Currently, grazing and general farming for production of livestock feeds are the major agricultural uses. Agricultural uses may become more specialized such as plant nurseries, sod farming, etc. but in making land use decisions consideration should be given to the time floods usually occur and when the crop or product is vulnerable to flood damage.

Industrial and commercial uses are somewhat limited within the floodway (that area capable of conveying flood discharge); parking lots, loading areas, and such are best suited. Flood proofing measures could extend the use of these areas for these purposes. Construction of buildings so that the floors are above the expected flood levels; construction of barriers, dikes, and levees; and special structural features to keep water out of buildings are possible flood proofing measures. Many flood proofing techniques are dependent upon flood forecasting. Forecasting floods from thunderstorms, however, is currently unreliable.

Recreational uses of the floodplain are limited due to the characteristics of the floods. The short duration and high rate of runoff provide very little warning. Such conditions would always pose a high hazard to any stationary

facilities within the floodway area. Still, the area could be effectively used for golf courses, tennis courts, driving ranges, archery ranges, picnic grounds, parks, wildlife and nature preserves, game farms, hiking, horseback trails, bicycle paths, and such.

Control of land use in the flood hazard area to achieve multiple goals can be accomplished by adoption of zoning and subdivision regulations, building and housing codes and sanitary codes with specific flood hazard provisions.

At minimum a regulatory approach should combine the use of flood lines or floodway zoning regulations, to restrict the type and nature of development in floodway and high hazard areas, with zoning standards, building codes, or sanitary codes to require minimum building protection elevations for uses in low hazard areas.

In rural lands where floodplain zoning is not immediately possible, a practical interim approach may involve a combined adoption of stringent sanitary codes that prohibit or severely restrict use of on-site waste disposal in flood hazard areas. Subdivision regulations could effectively prohibit subdivision of flood prone lands.

Special statutes might be established to require sellers and real estate brokers to disclose flood hazard regulations applicable to marketed lands. The town of Inkom has encroached on the Rapid Creek floodplain. Several houses have experienced some flood damage three or four times since their construction. Other houses are located in precarious positions along the creek and at the mouth of tributaries. Any further residential developments

should evaluate the flood risk by location along the creek, at the mouth of Rapid Creek and the mouth of each tributary.

The watershed area is conducive to development because of the rural setting and relatively convenient access to and from Pocatello. There are suitable locations within the watershed area where houses could be built if precautions are taken in considering pertinent hazards such as flooding, landslides, slope stability, limitations for septic tank drain fields, etc.

Floodways and Flood Lines

Plates 2 through 18 show the surface areas covered by the 25, 50 and 100-year floods. Valley section sheets, Plates 19 and 20, show typical floodway areas occupied by these three floods.

Flood lines are the lateral boundaries of the floodway which show on the plan view as the outer boundaries, on each side of the creek, of the 25, 50, and 100-year floods. Encroachment within these boundaries may cause a rise of the flood elevations. The amount of rise produced is dependent upon the number and type of obstructions and their effect upon the conveyance ability of the floodway. Therefore, it is important to consider the extent of construction, landfilling, or other obstructions that can be allowed between these lines.

Reduction of Existing Damage Potential

There are several areas of high hazard to existing facilities. Three significant areas are: (1) at the mouth of Rapid Creek, (2) through the town of Inkom, and (3) on alluvial fans along the edge of the valley.

Upstream floodwater retarding structures or debris basins could provide significant flood control and consequent protection to the town of Inkom. Such a structure or structures would have to be located in the near vicinity of the town. The potential sites have rather limited capacities but they should be considered.

Reduction of damage potential can be achieved by constructing dikes or levees along the creek, enlargement of bridges and culverts, and clearing of obstructions to flood flows.

Existing houses and other buildings along or at the mouth of Rapid Creek can be individually protected by dikes along their property boundaries or by other flood proofing measures.

Any protective action taken for those houses located at the mouth of Rapid Creek should also consider the damage potential from the Portneuf River.

Buildings located on the alluvial fans can be protected also by diversion dikes and flood proofing measures. Structures to trap rock, sediment and debris constructed at safe sites upstream from where the channels discharge onto the fan areas could also effectively reduce damage potentials.

The most positive effect can be acquired by watershed protection achieved by proper use and treatment. Proper treatment varies according to the land use but would include such practices as conservation cropping systems, contour farming, deferred grazing, proper grazing use, range seeding, and change from cropland to grassland on steep areas. Supplemental structural means

could include debris basins, terraces, grassed waterways, streambank protection, or possibly multiple purpose dams.

Flood Insurance

There is now available, to eligible communities, coverage in the form of federally subsidized flood insurance under the National Flood Insurance Program administered by the Federal Insurance Administration of the U.S. Department of Housing and Urban Development. The availability of this insurance should be considered along with the adoption and enforcement of land use and control measures to reduce the hardships and damages from flooding. Refer to Appendix A for excerpts from National Flood Insurance Act of 1968, as amended.

USE OF FLOOD HAZARD AREA MAPS AND FLOOD PROFILE SHEETS

To determine a floodwater elevation at a specific location use the following procedure:

1. Use the Flood Hazard Area Map Index, Plate 1, to determine which plan-profile sheet, Plates 2 through 18, will contain the location in question.
2. Determine the position of the location in question on the plan view part; that is, within the Flood Hazard Area.
3. Estimate the station near the location in question by measuring the distance, using the indicated map scale, from a given valley or road cross-section along the creek channel to the desired location.

4. Find the station location on the profile part of the sheet and proceed vertically from the station scale to the plotted water surface for the desired flood. Then go horizontally to the left to read the water surface elevation.

GLOSSARY OF SELECTED TERMS

Air Circulation Pattern -- The flow of air caused by thermal, rotational, land and water effects.

Alluvial Fan -- Areas along the bases of mountains that developed by deposition of debris carried by flows from mountain streams.

Convective Thunderstorms -- Short duration, high intensity storms resulting from convective build-up or from convective cells developed along weak, fast moving cold fronts. Uplifts and downdrafts are characteristic and frequently produces hail as part of the storm precipitation.

Flood Frequency -- An expression of how often a hydrologic event of given size or magnitude should, on an average, be equaled or exceeded.

100-year flood is the size of flood which will be equaled or exceeded, on the average, of once in 100 years.

50-year flood is the size of flood which will be equaled or exceeded, on the average, once in 50 years.

25-year flood is the size of flood which will be equaled or exceeded, on the average, once in 25 years.

Flood Hazard -- The risk to life or damage to property from overflows of the river or stream channel; flood flow in intermittent or normally dry streams; floods on tributary streams; floods caused by accumulated debris or ice in rivers; or other similar events.

Flood Lines -- Lateral boundaries of the floodway.

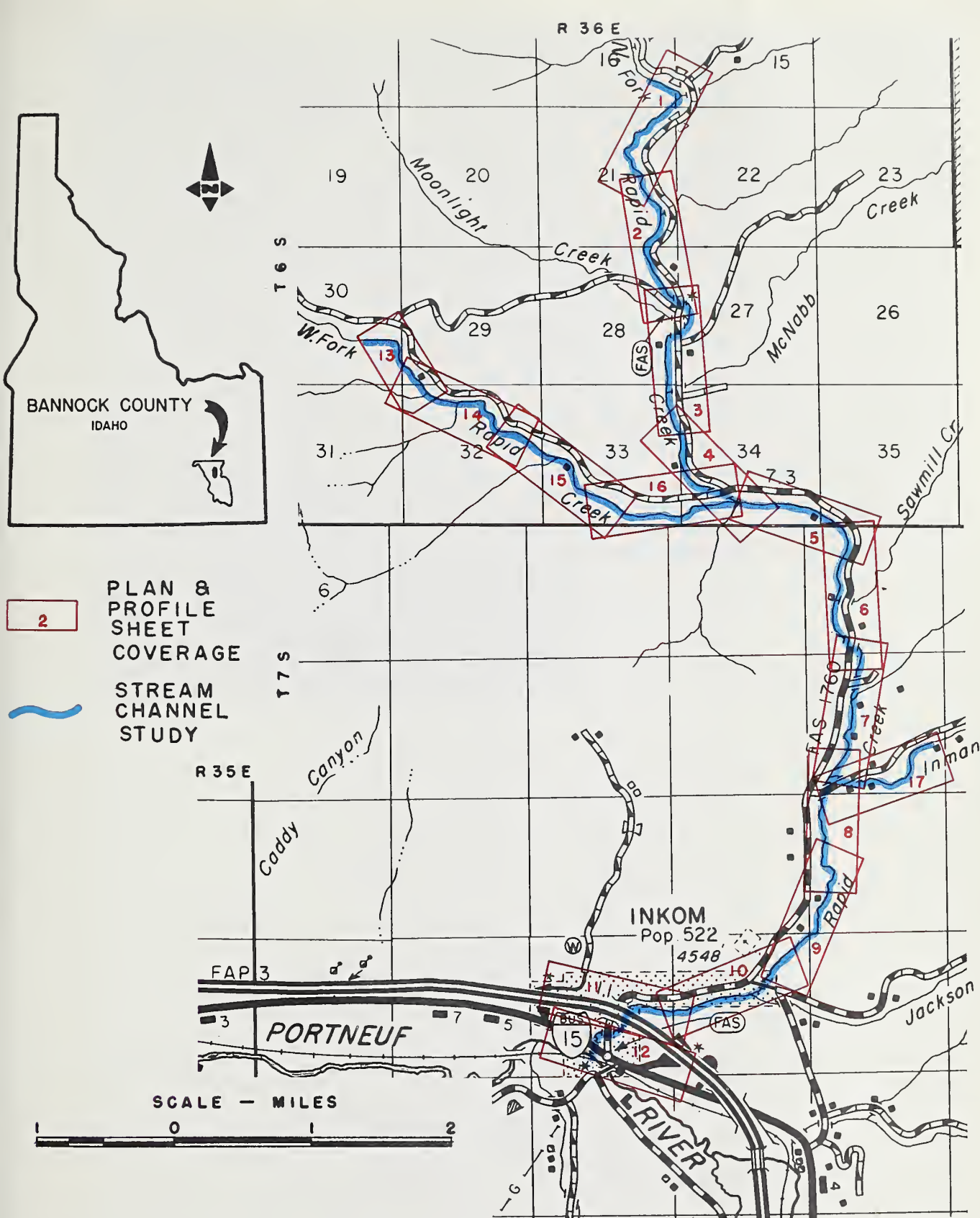
Flood Proofing -- A combination of structural provisions, changes, or adjustments to properties and structures subject to flooding primarily for the reduction or elimination of flood damages to properties, water and sanitary facilities, structures, and contents of buildings in a flood hazard area.

Floodway -- The portion of a floodplain consisting of the stream channel and overbank areas capable of conveying a selected flood discharge.

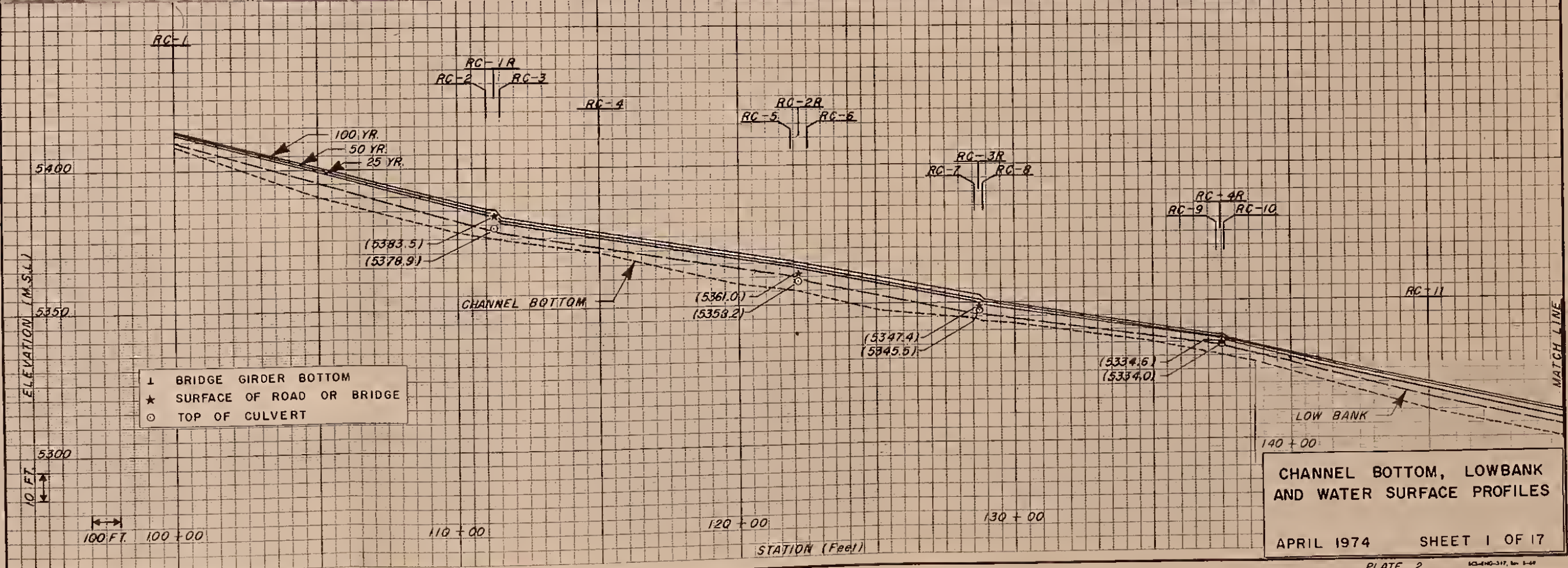
Indirect Peak Flow Measurements -- Measurements made after flood flows have passed relating discharge to the water-surface profile and the geometry of the channel.

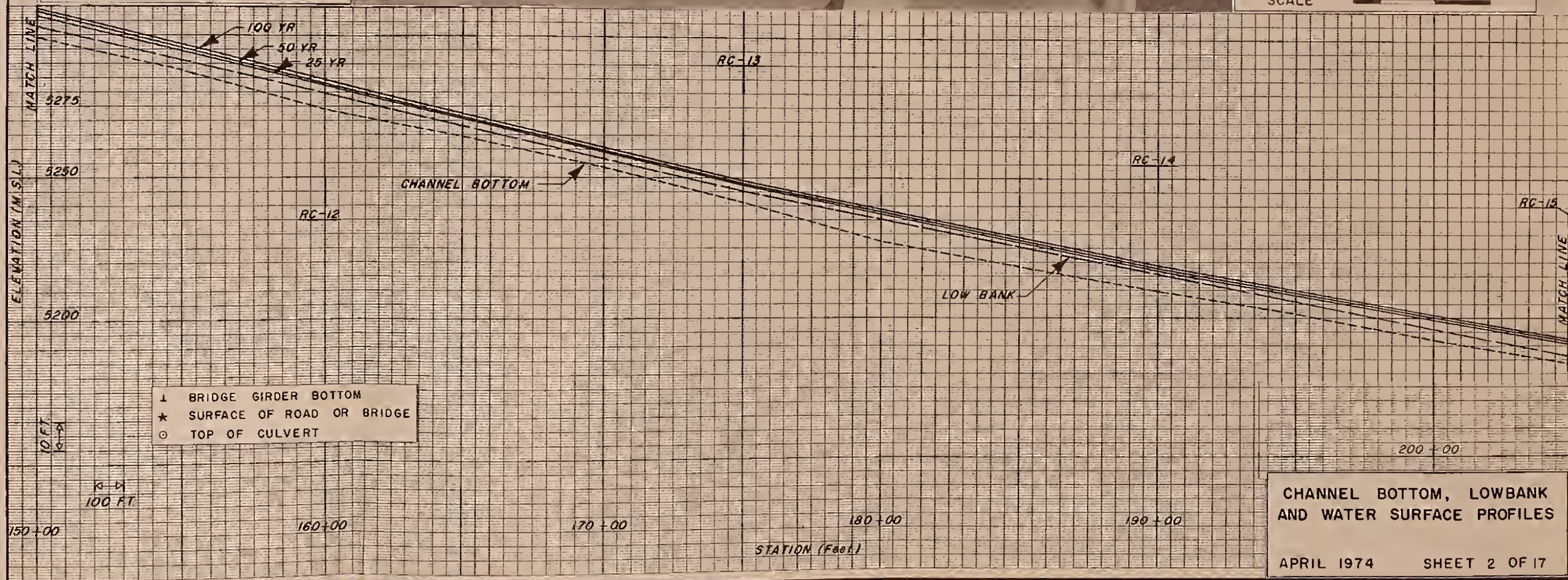
River Mile -- The distance in miles measured along the centerline of the river from the mouth of the river in an upstream direction.

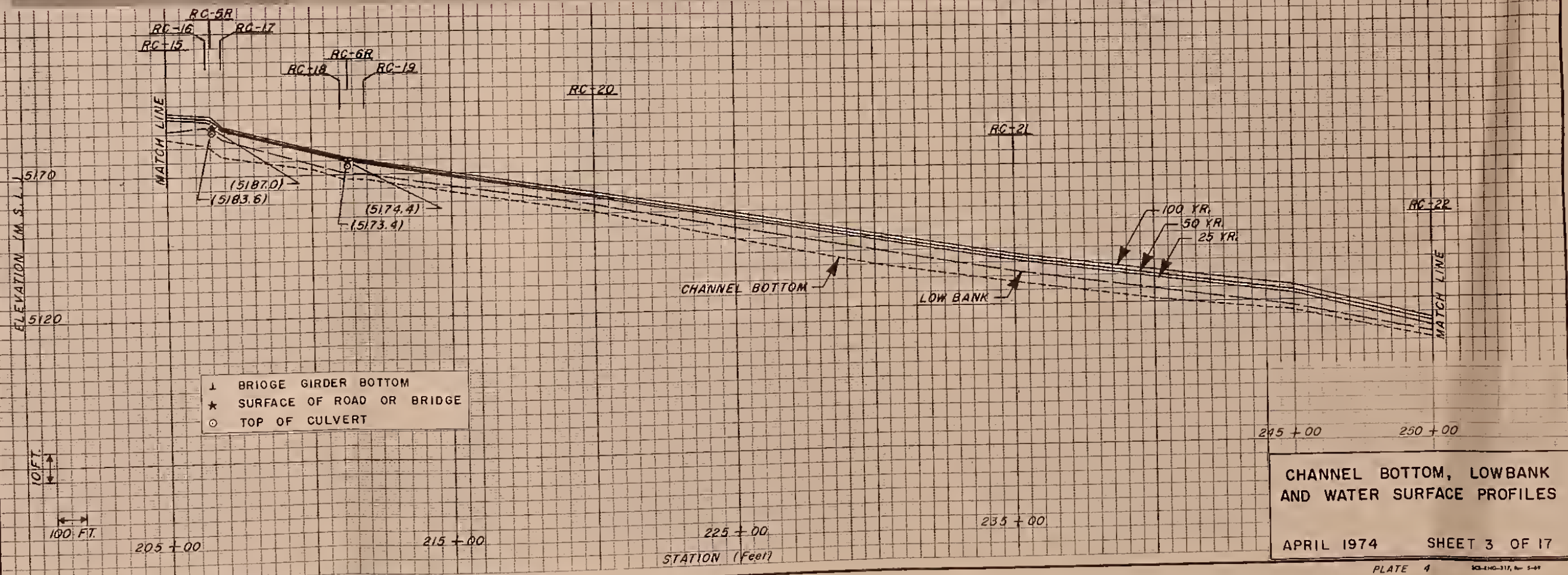
- 7.5 Minute Series Quadrangle* -- An adopted United States Geological Survey unit of area bounded by latitudes and longitudes separated by $7\frac{1}{2}$ minutes and published to a scale of 1:24,000 (1 inch = 2,000 feet).
- Uncontrolled Mosaic* -- Matching of corresponding print images and taping or gluing pictures together, or by cutting and butt-joining copy negatives of the pictures. The final mosaic prints may show joints, contain some mismatches, and errors in scale and direction, particularly if the terrain of the area is rough. Distortion on the outer fringe of the photos can cause scale and matching problems.
- WSP2 Computer Program* -- An SCS automatic data processing program using the standard step method of backwater computation for gradually varied and subcritical flow to compute water-surface profiles.

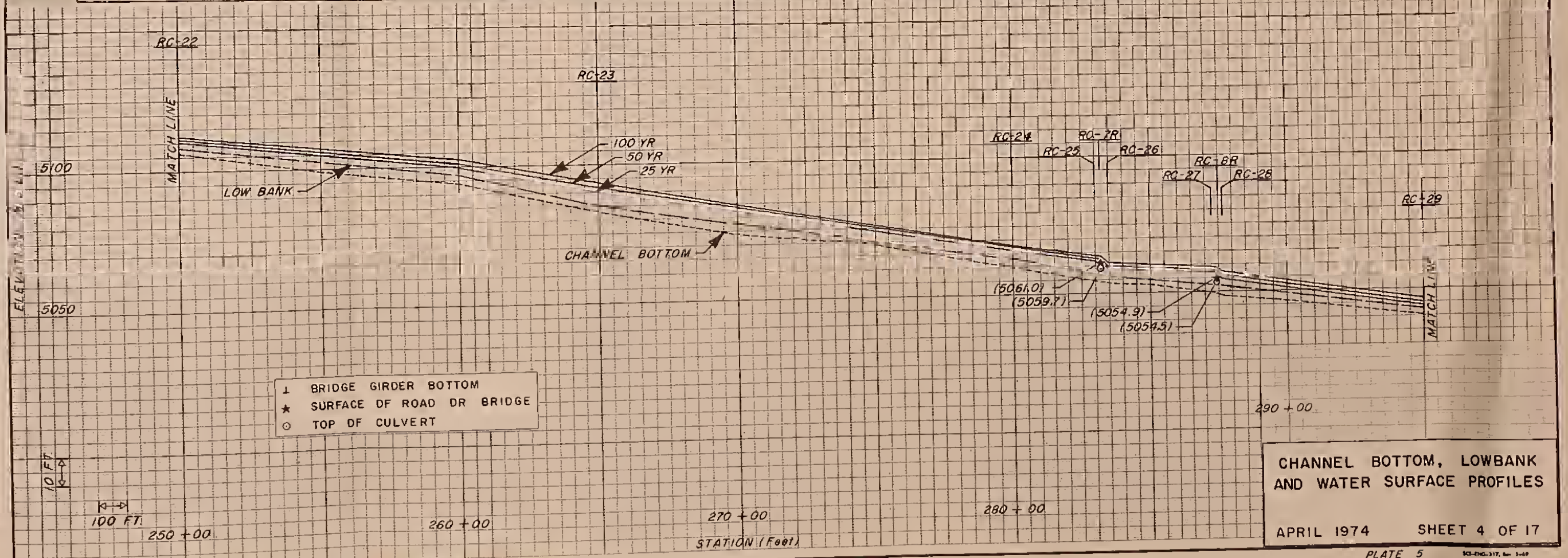


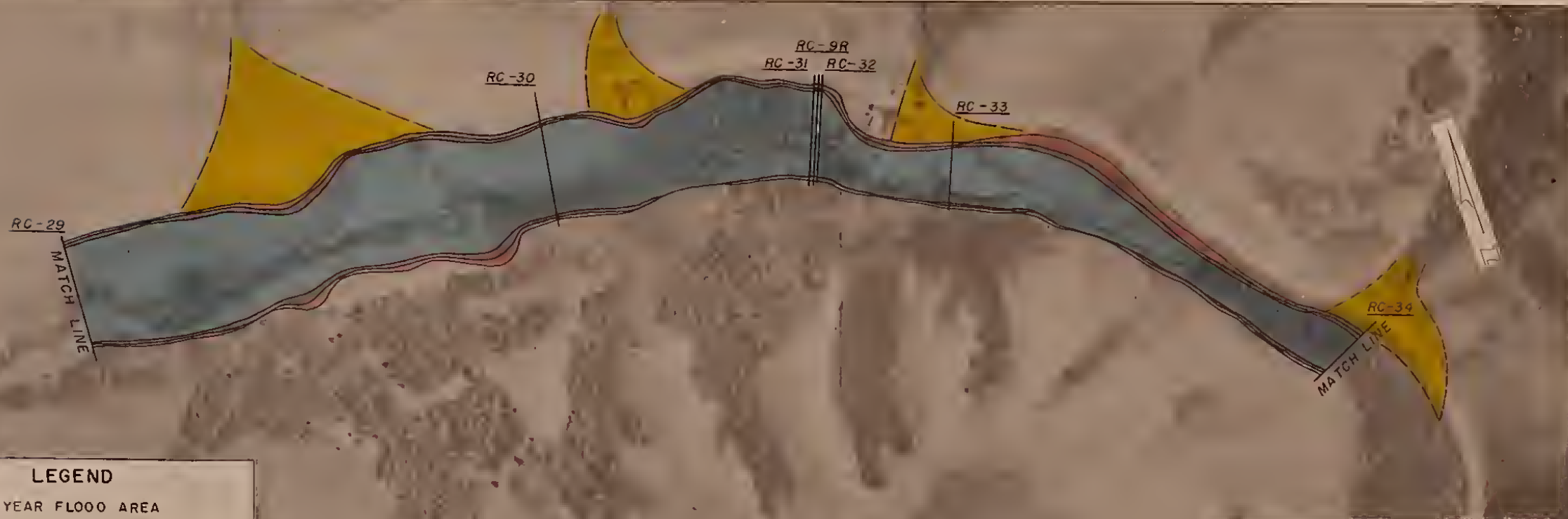
FLOOD HAZARD AREA MAP INDEX
RAPID CREEK
BANNOCK COUNTY, IDAHO











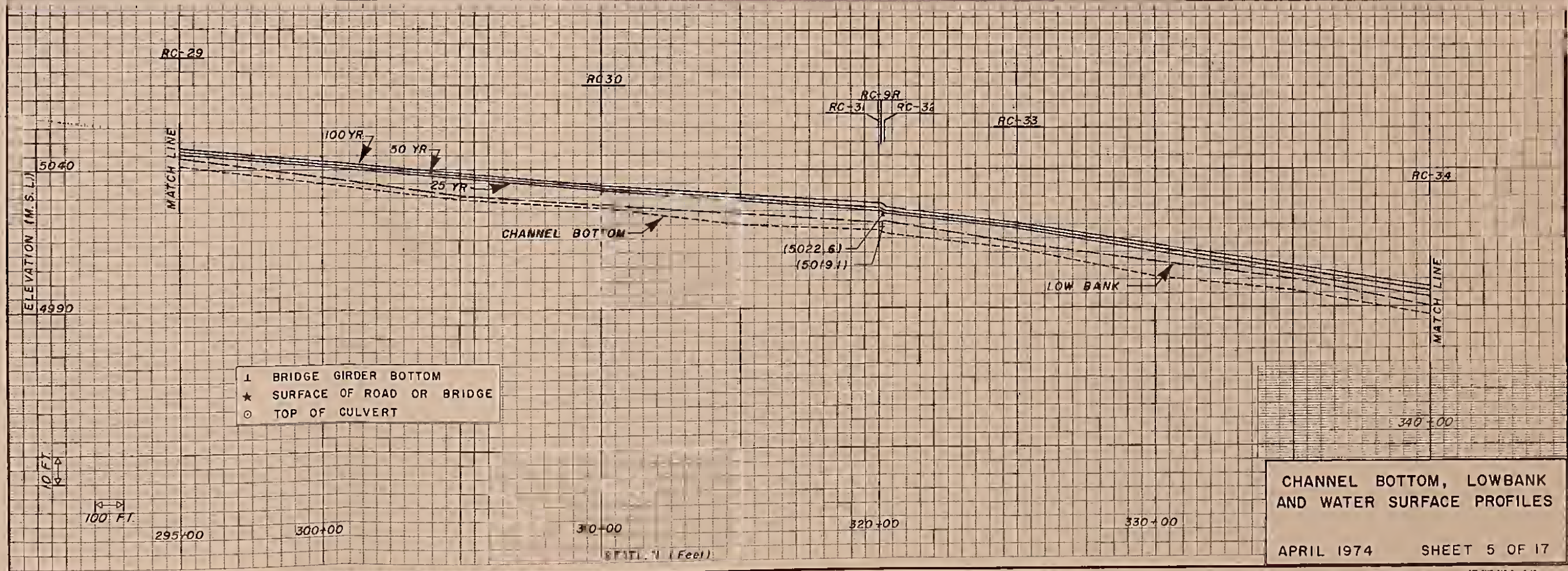
LEGEND

- 100 YEAR FLOOD AREA
- 50 YEAR FLOOD AREA
- 25 YEAR FLOOD AREA
- RC-6 VALLEY SECTION
- HIGH HAZARD AREA (UNDEFINED)

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND

FLOOD HAZARD AREAS
RAPID CREEK
 BANNOCK COUNTY, IDAHO

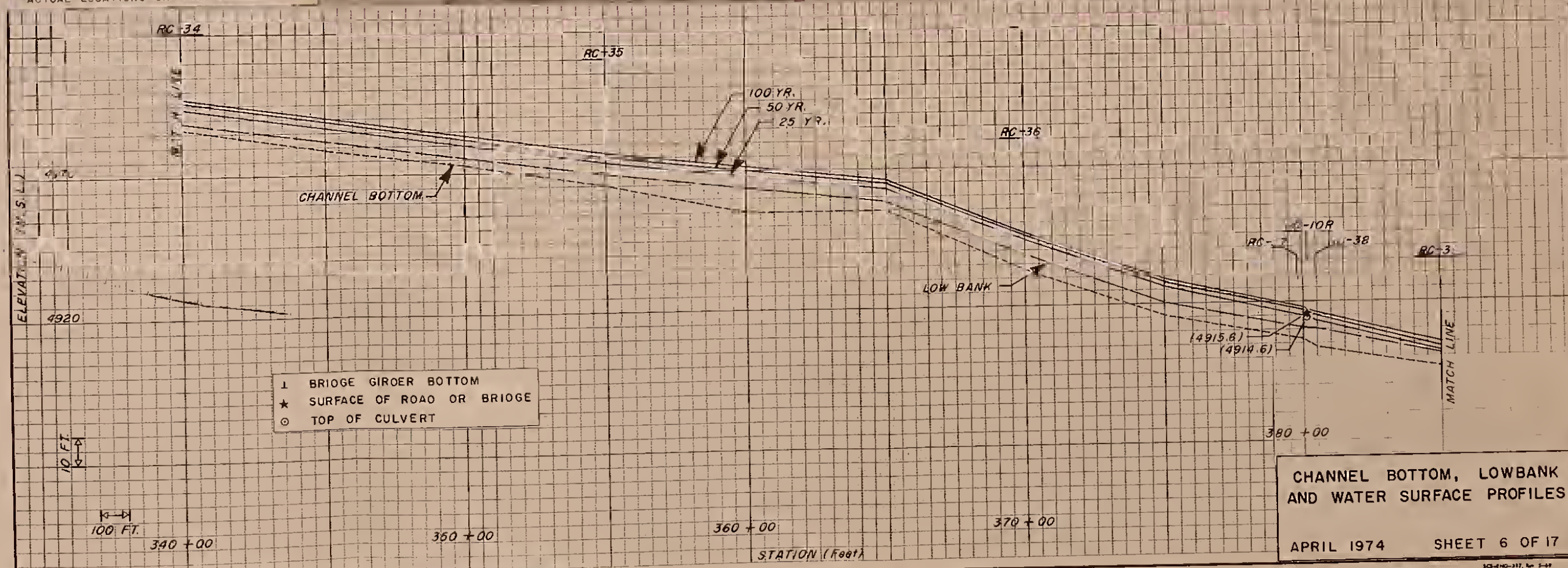
SCALE
100
0
200
400 ft.

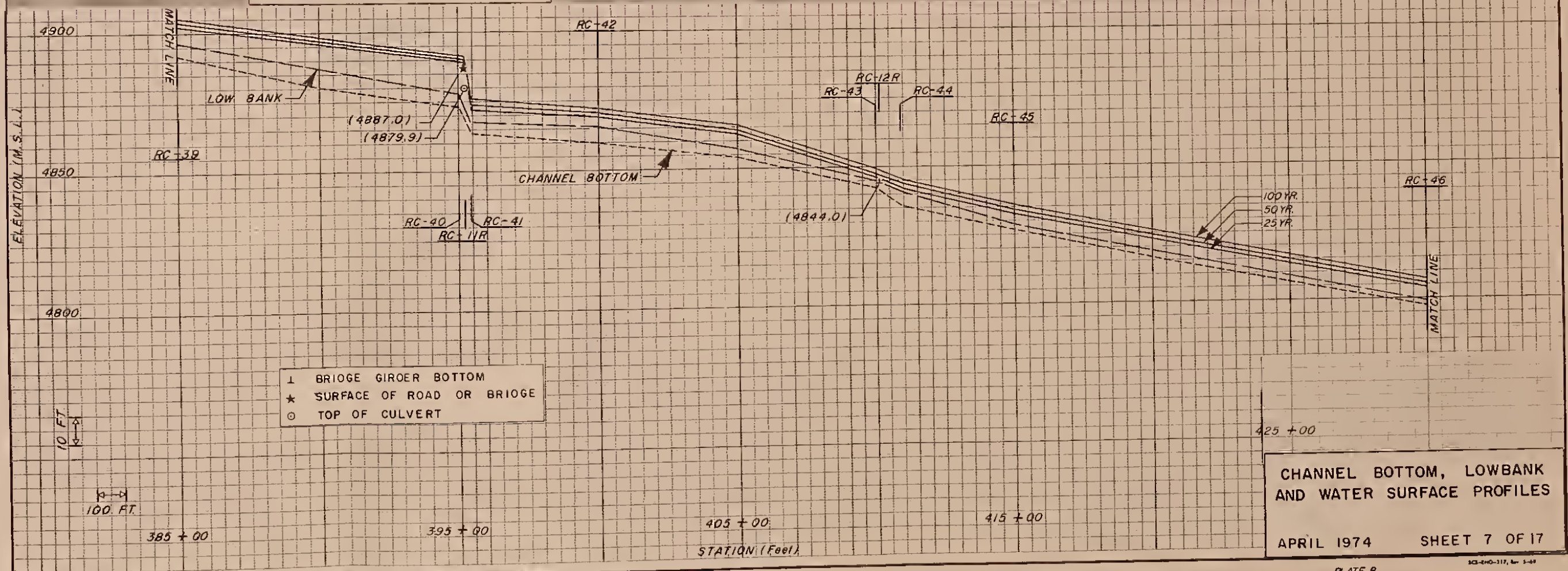
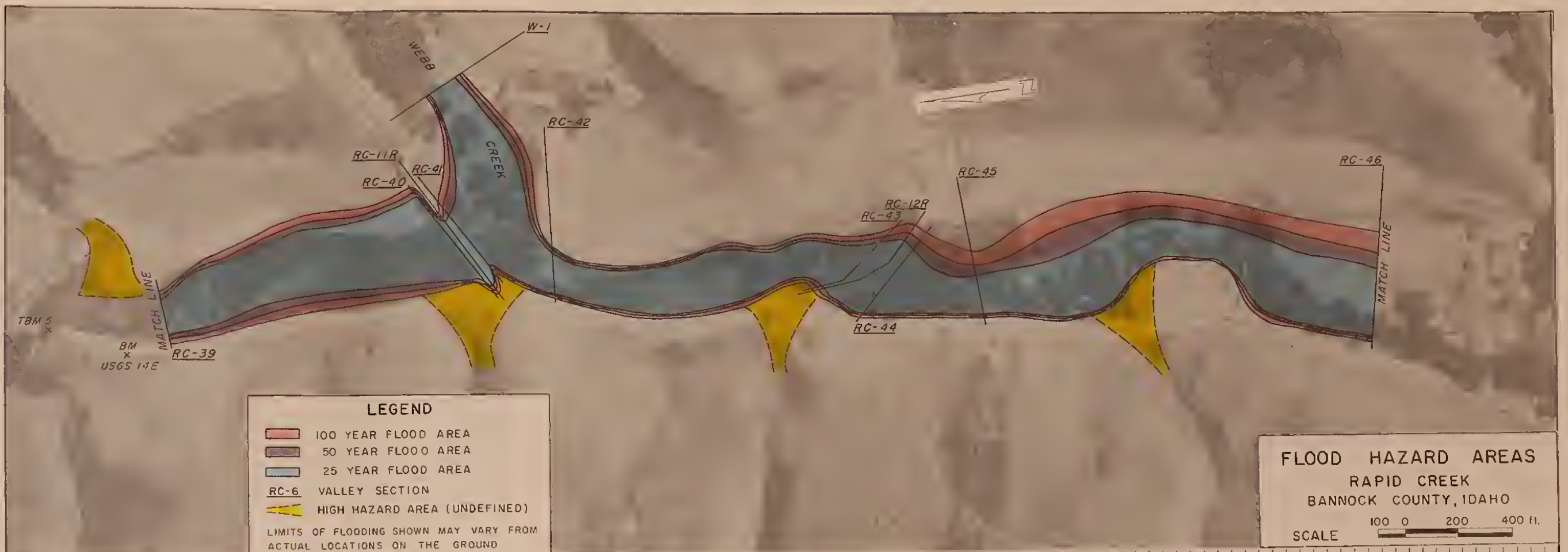


1 BRIDGE GIRDER BOTTOM
 ★ SURFACE OF ROAD OR BRIDGE
 ○ TOP OF CULVERT

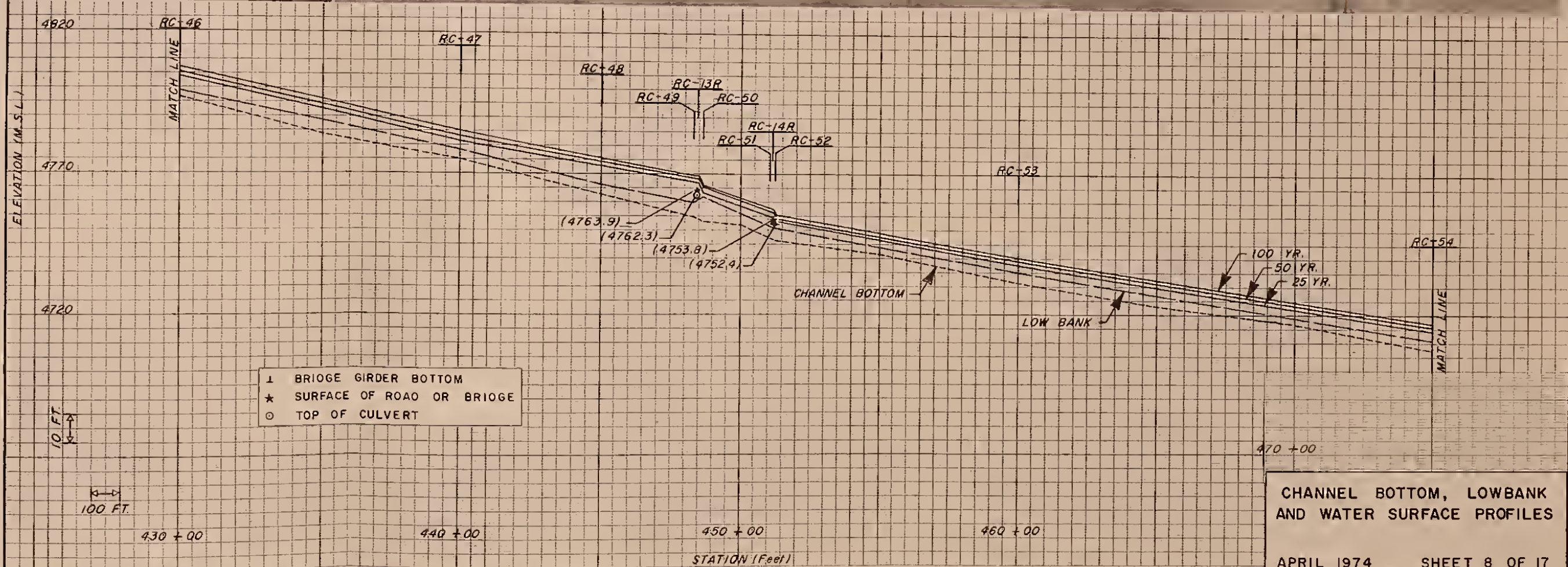
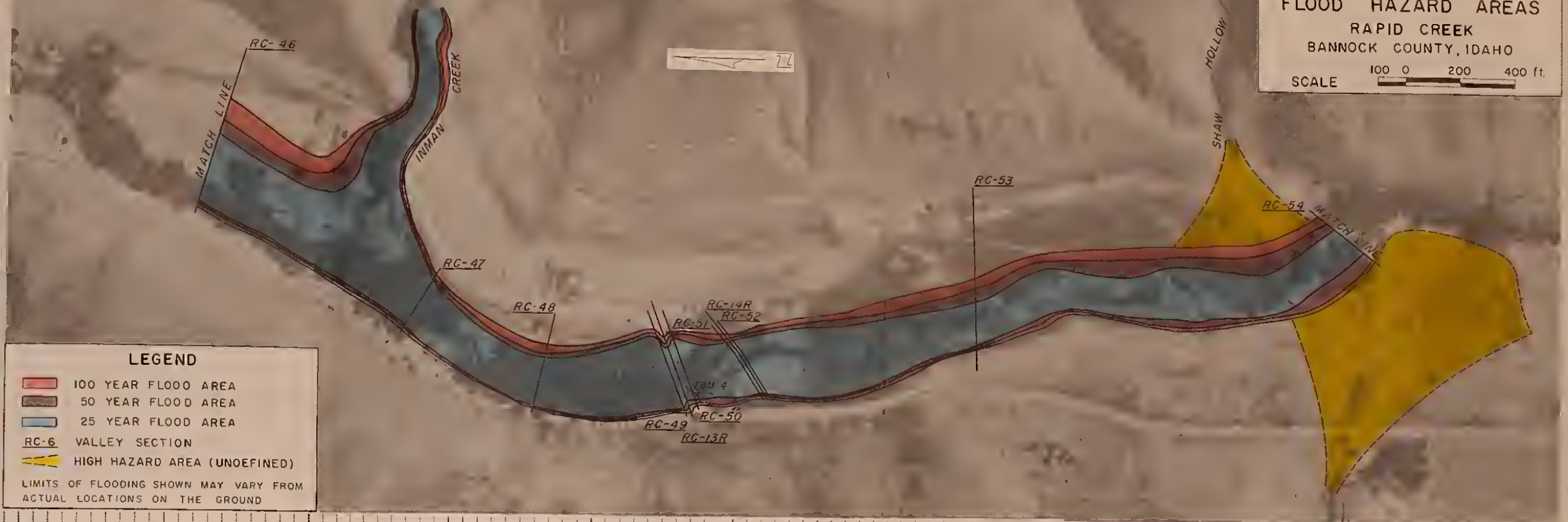
**CHANNEL BOTTOM, LOWBANK
 AND WATER SURFACE PROFILES**

APRIL 1974 SHEET 5 OF 17





FLOOD HAZARD AREAS
RAPID CREEK
BANNOCK COUNTY, IDAHO
SCALE 100 0 200 400 ft.



CHANNEL BOTTOM, LOWBANK
AND WATER SURFACE PROFILES

APRIL 1974 SHEET 8 OF 17

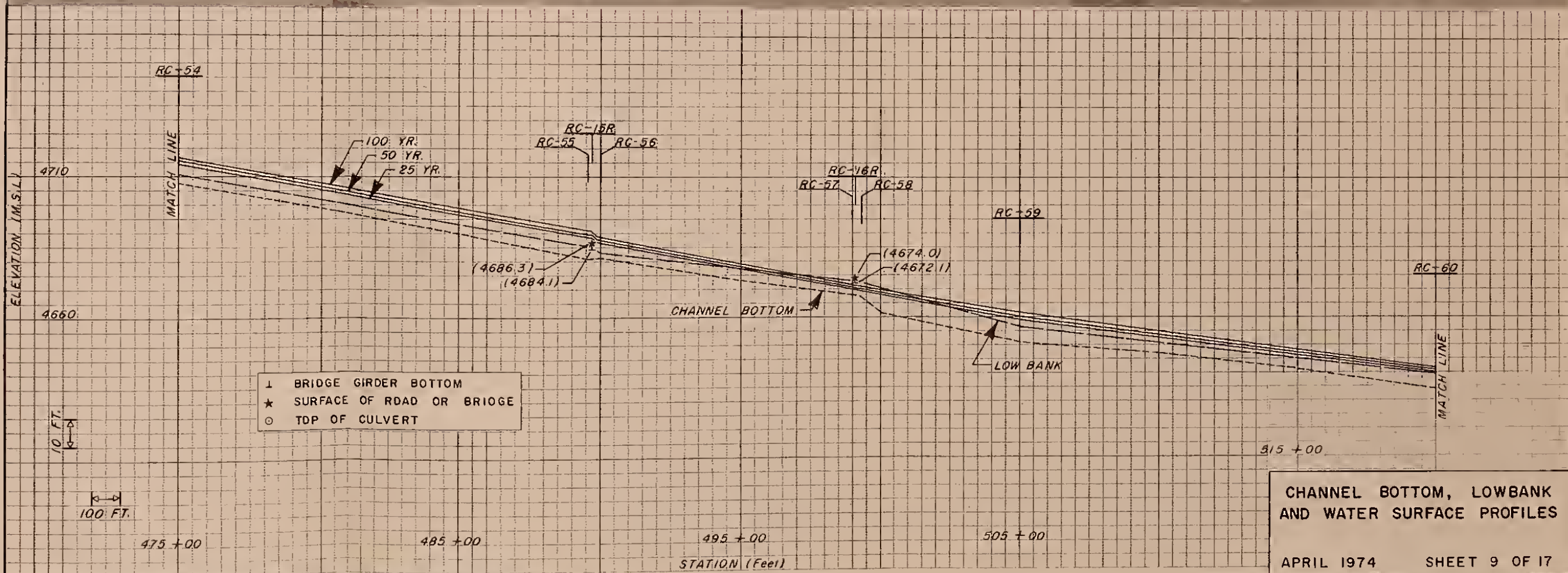
LEGEND

- 100 YEAR FLOOD AREA
 - 50 YEAR FLOOD AREA
 - 25 YEAR FLOOD AREA
 - RC-6 VALLEY SECTION
 - HIGH HAZARD AREA (UNDEFINED)
- LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND

FLOOD HAZARD AREAS

RAPID CREEK
BANNOCK COUNTY, IDAHO

SCALE 100 0 200 400 ft.



CHANNEL BOTTOM, LOWBANK
AND WATER SURFACE PROFILES

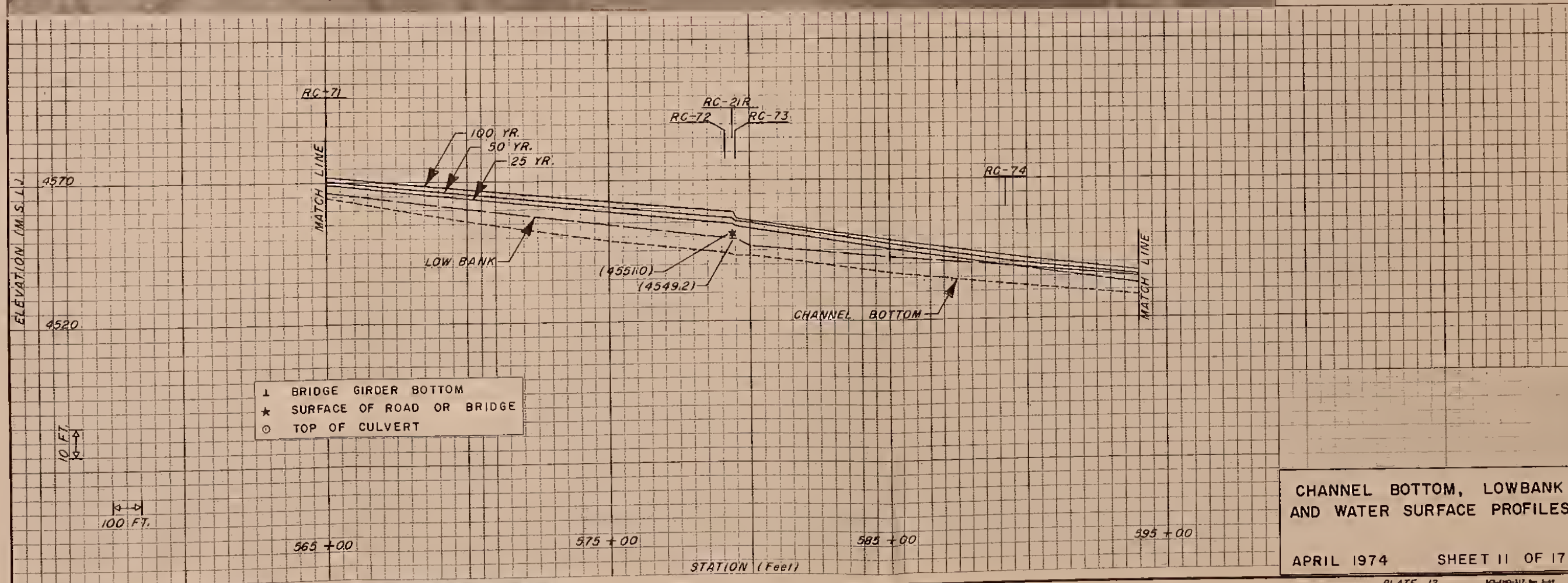
APRIL 1974 SHEET 9 OF 17

LEGEND

- 100 YEAR FLOOD AREA
 - 50 YEAR FLOOD AREA
 - 25 YEAR FLOOD AREA
 - RC-6 VALLEY SECTION
 - HIGH HAZARD AREA (UNDEFINED)
- LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND



FLOOD HAZARD AREAS
RAPID CREEK
BANNOCK COUNTY, IDAHO
SCALE 100 0 200 400 ft.



CHANNEL BOTTOM, LOWBANK
AND WATER SURFACE PROFILES.

APRIL 1974 SHEET 11 OF 17

PLATE 12 103-400-317, Rev. 5-69

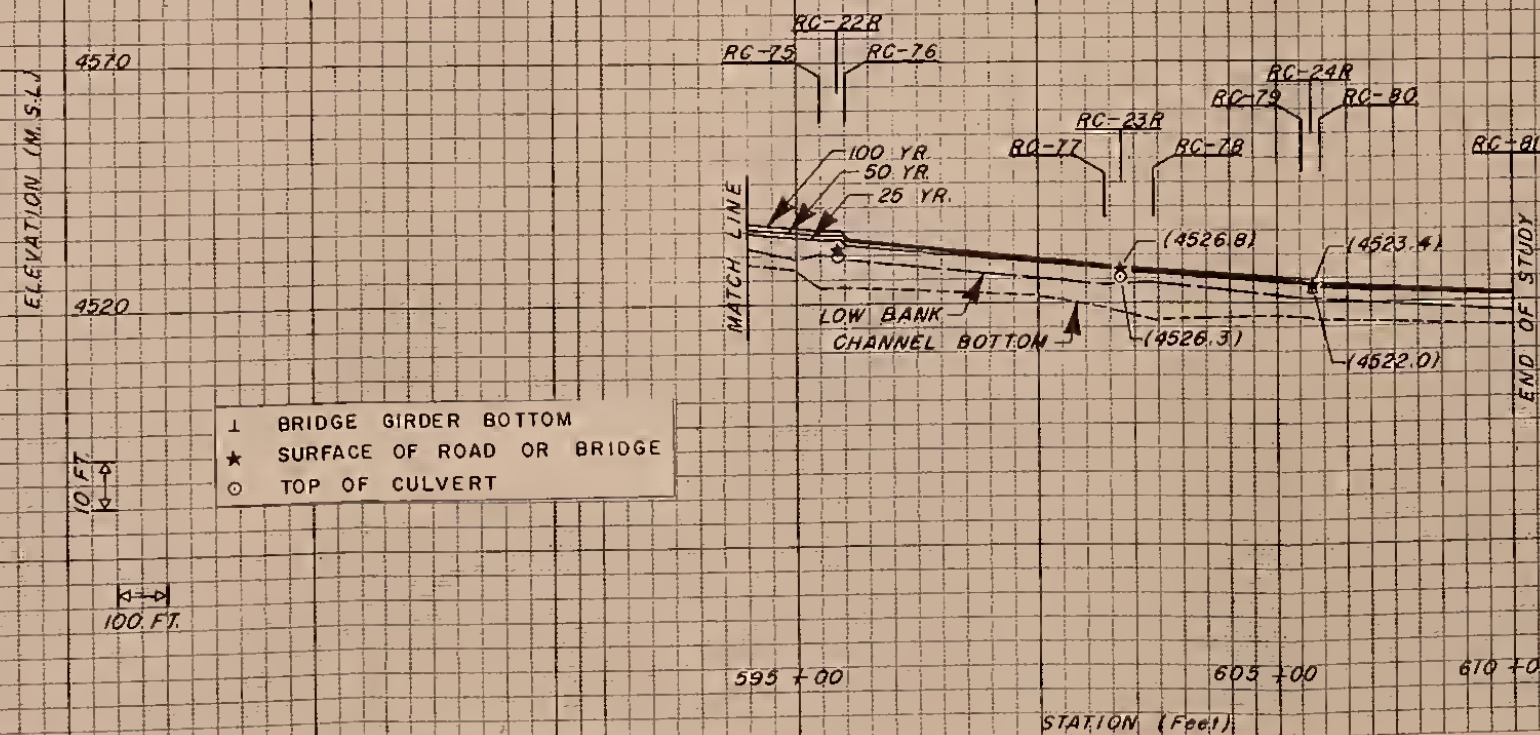
LEGEND

- 100 YEAR FLOOD AREA
 - 50 YEAR FLOOD AREA
 - 25 YEAR FLOOD AREA
 - RC-6 VALLEY SECTION
 - HIGH HAZARD AREA (UNDEFINED)
- LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND

THE 50-YEAR AND 100-YEAR FLOODS ARE ESTIMATED TO OCCUPY THE AREA WITHIN THE DASHED BOUNDARIES. THIS AREA INCLUDES MUCH OF THE ALLUVIAL FAN WHERE THE COURSE OF FLOW IS DIFFICULT TO PREDICT.



FLOOD HAZARD AREAS
RAPID CREEK
BANNOCK COUNTY, IDAHO
SCALE 100 0 200 400 ft.



CHANNEL BOTTOM, LOWBANK
AND WATER SURFACE PROFILES

APRIL 1974 SHEET 12 OF 17



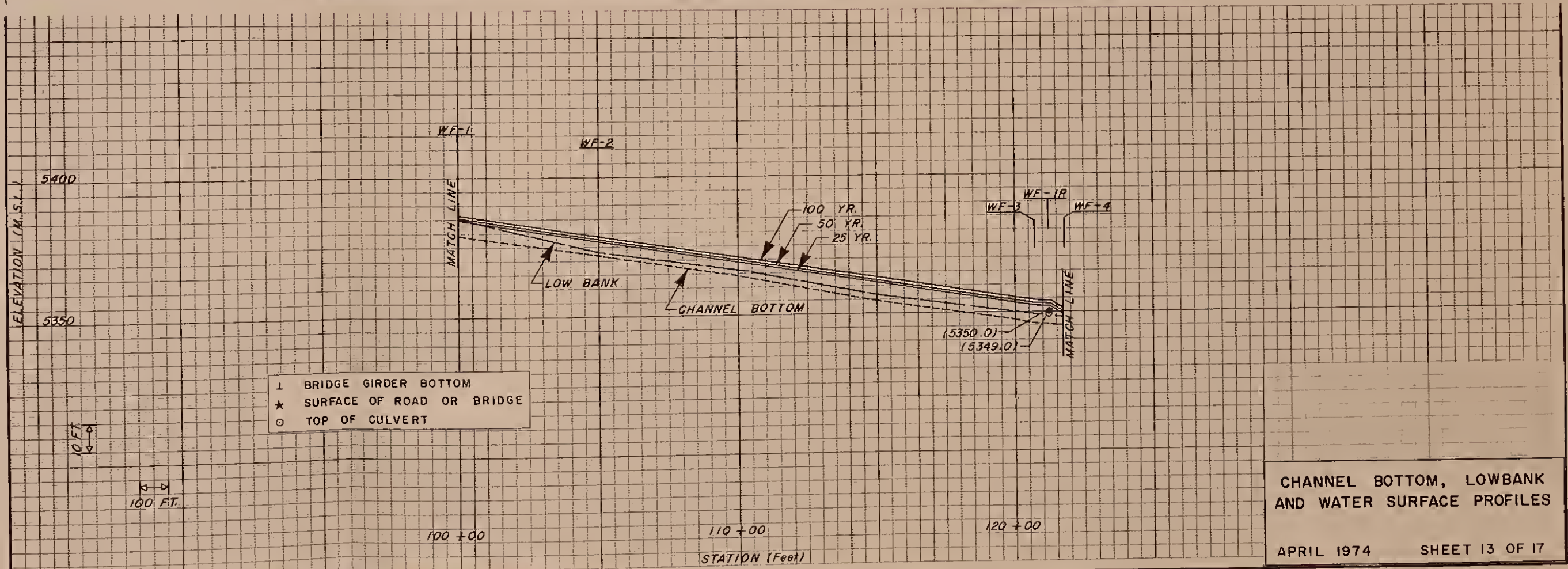
LEGEND

- 100 YEAR FLOOD AREA
- 50 YEAR FLOOD AREA
- 25 YEAR FLOOD AREA
- RC-6 VALLEY SECTION
- HIGH HAZARD AREA (UNDEFINED)

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND

FLOOD HAZARD AREAS
WEST FORK RAPID CREEK
BANNOCK COUNTY, IDAHO

SCALE
100
0
200
400 ft.



**CHANNEL BOTTOM, LOWBANK
AND WATER SURFACE PROFILES**

APRIL 1974 SHEET 13 OF 17



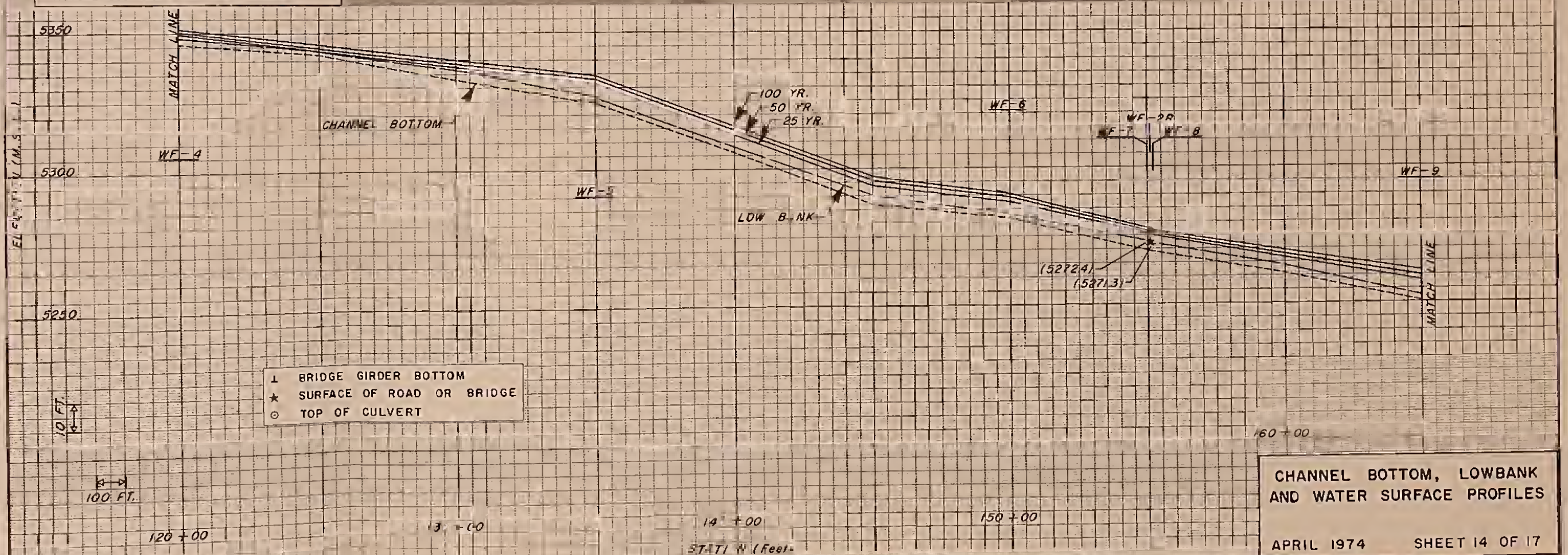
LEGEND

- 100 YEAR FLOOD AREA
- 50 YEAR FLOOD AREA
- 25 YEAR FLOOD AREA
- RC-6 VALLEY SECTION
- HIGH HAZARD AREA (UNDEFINED)

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND

FLOOD HAZARD AREAS WEST FORK RAPID CREEK BANNOCK COUNTY, IDAHO

SCALE 100 0 200 400 ft.



CHANNEL BOTTOM, LOWBANK
AND WATER SURFACE PROFILES

APRIL 1974 SHEET 14 OF 17

PLATE 15

103-210-317, Rev. 1-64

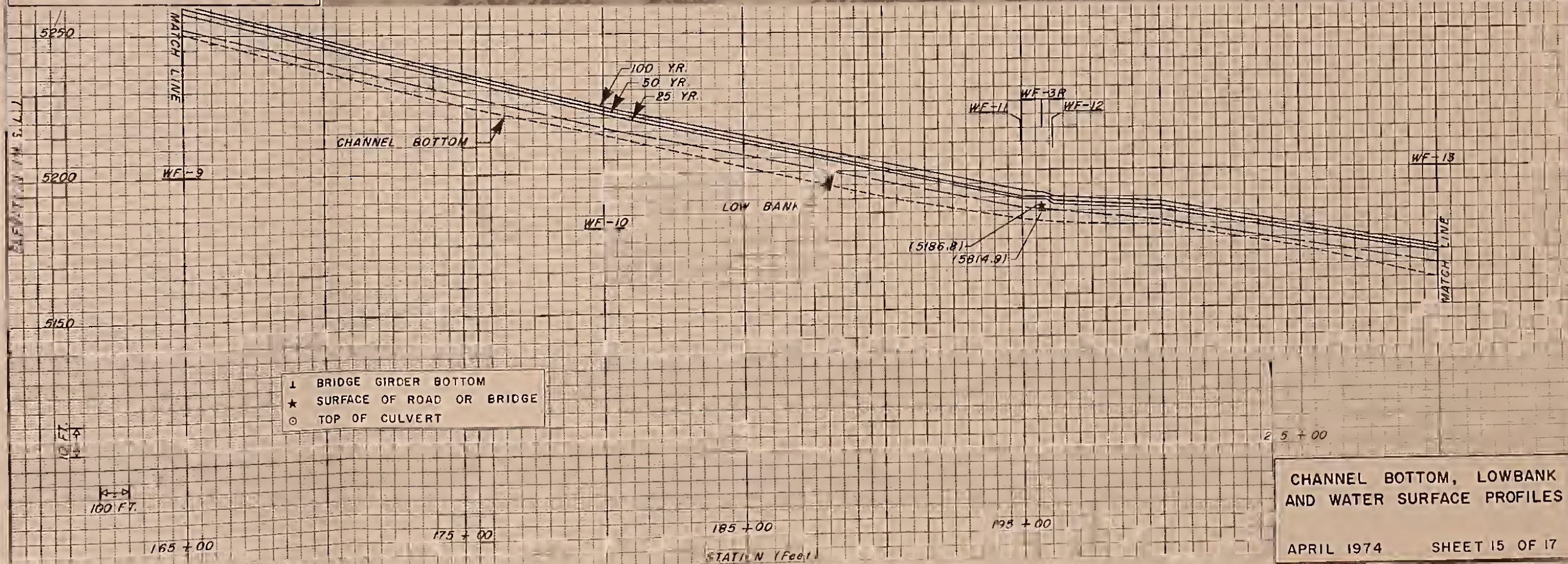


LEGEND

- 100 YEAR FLOOD AREA
 - 50 YEAR FLOOD AREA
 - 25 YEAR FLOOD AREA
 - RC-6 VALLEY SECTION
 - HIGH HAZARD AREA (UNDEFINED)
- LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND

FLOOD HAZARD AREAS WEST FORK RAPID CREEK BANNOCK COUNTY, IDAHO

SCALE 100 0 200 400 ft.

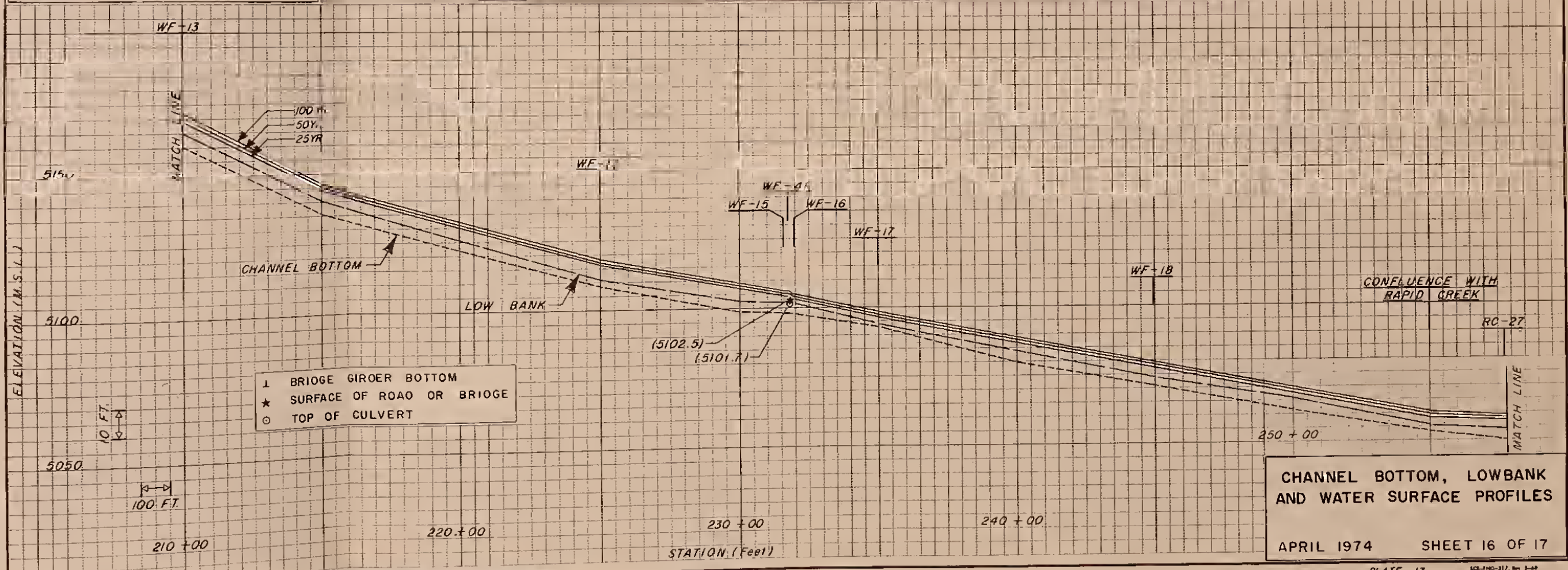


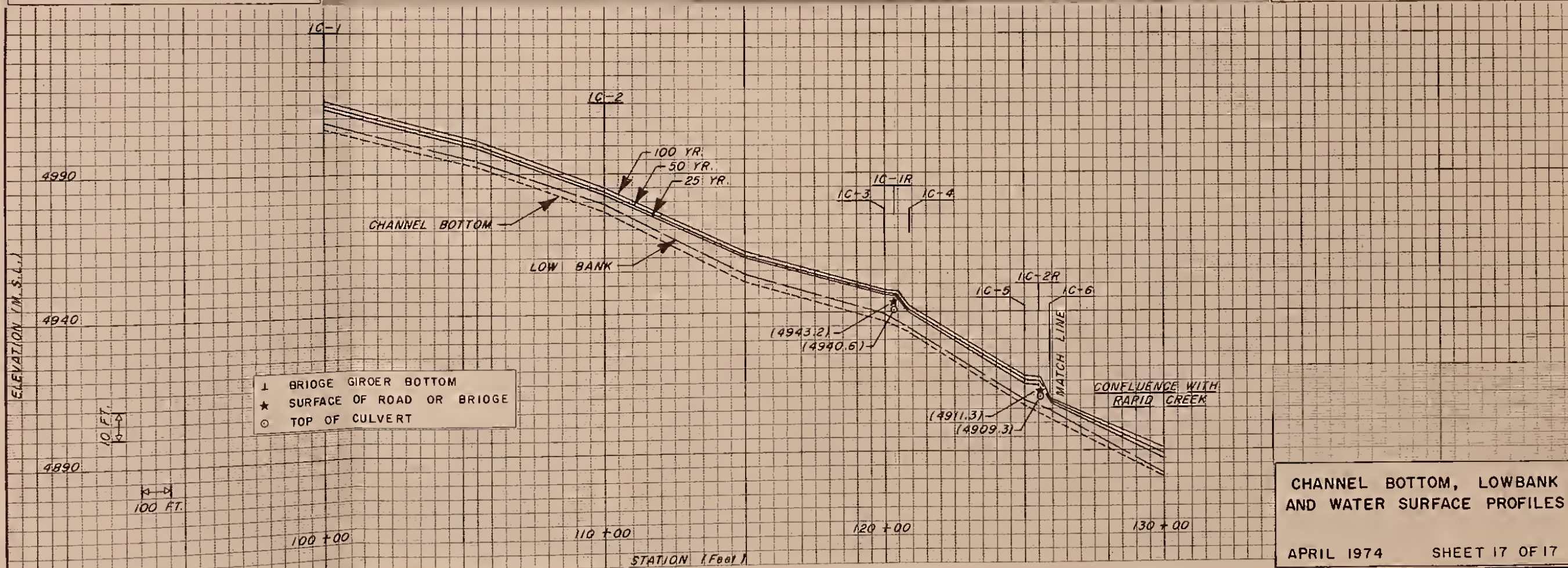
- △ BRIDGE GIRDER BOTTOM
- ★ SURFACE OF ROAD OR BRIDGE
- TOP OF CULVERT

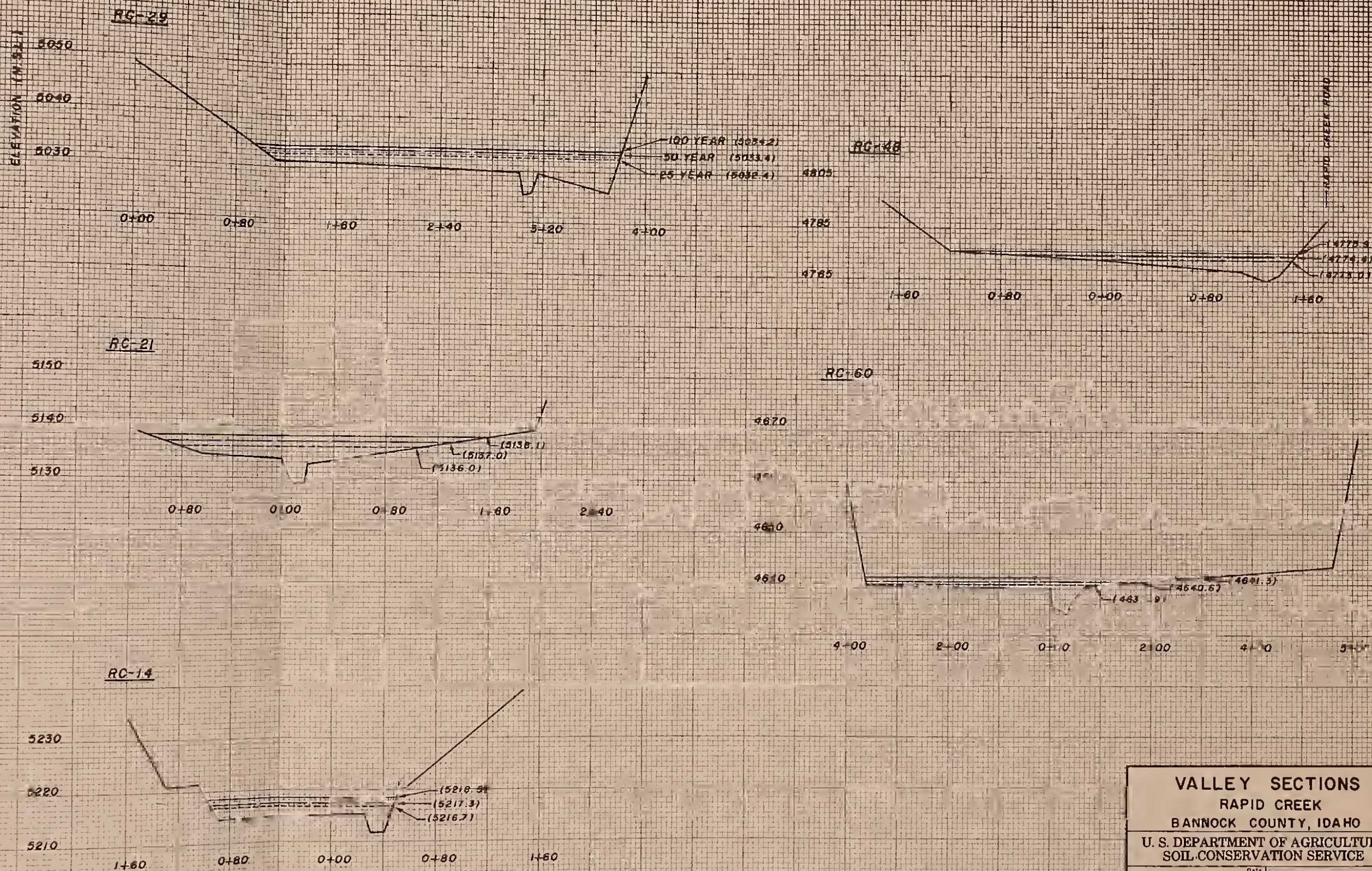
CHANNEL BOTTOM, LOWBANK AND WATER SURFACE PROFILES

APRIL 1974 SHEET 15 OF 17

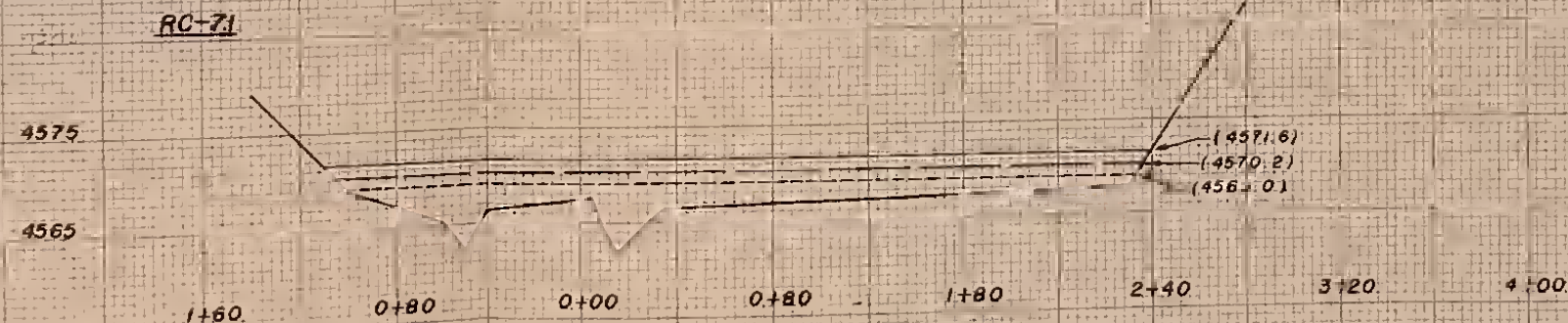
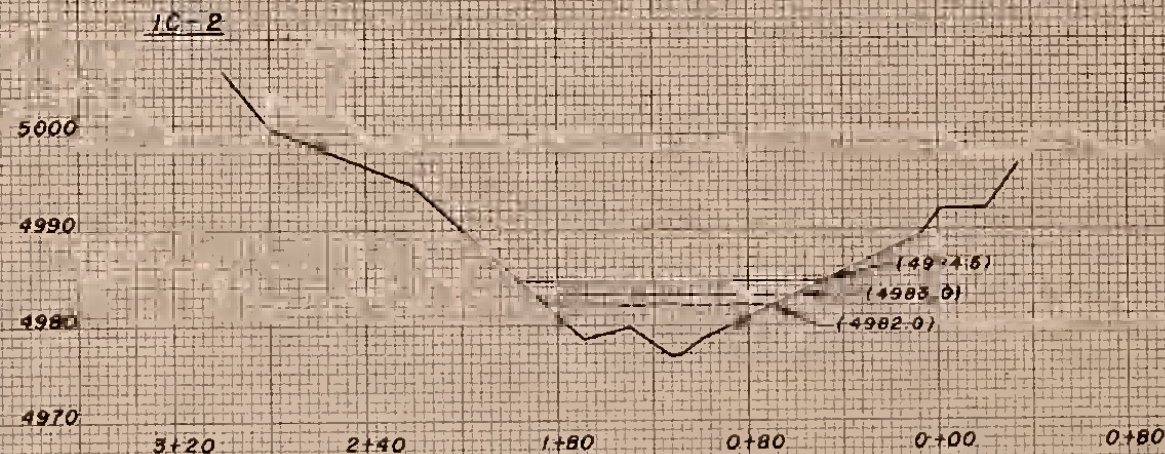
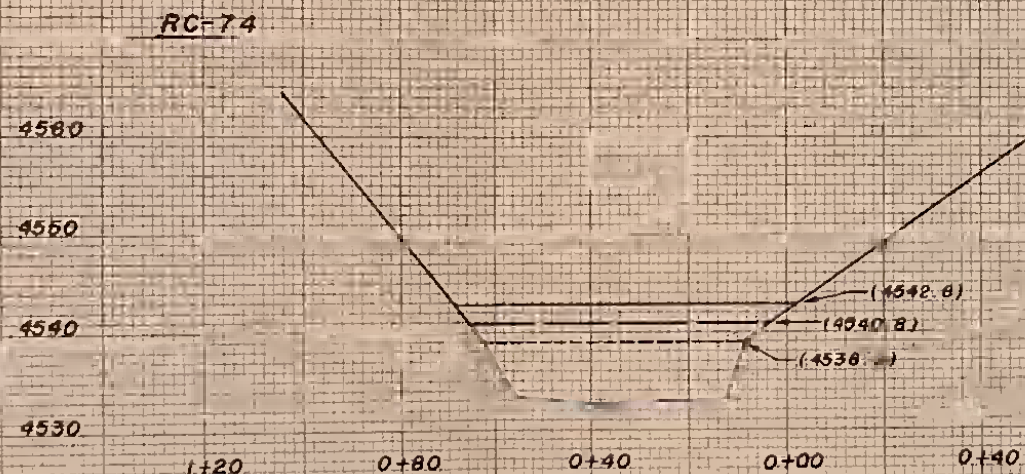
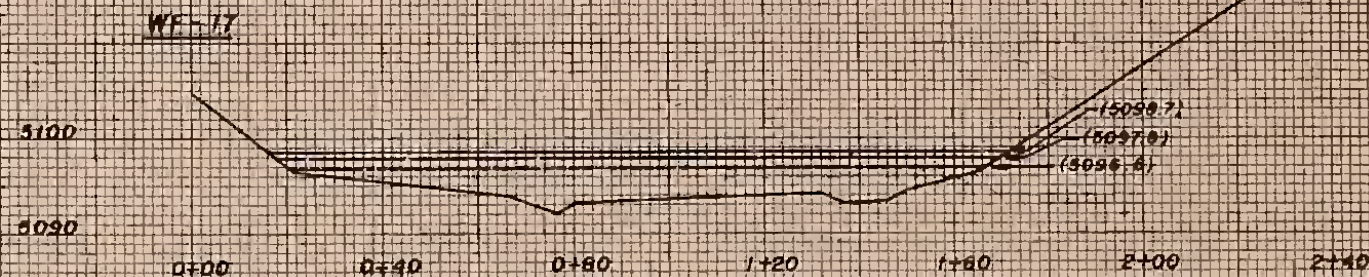
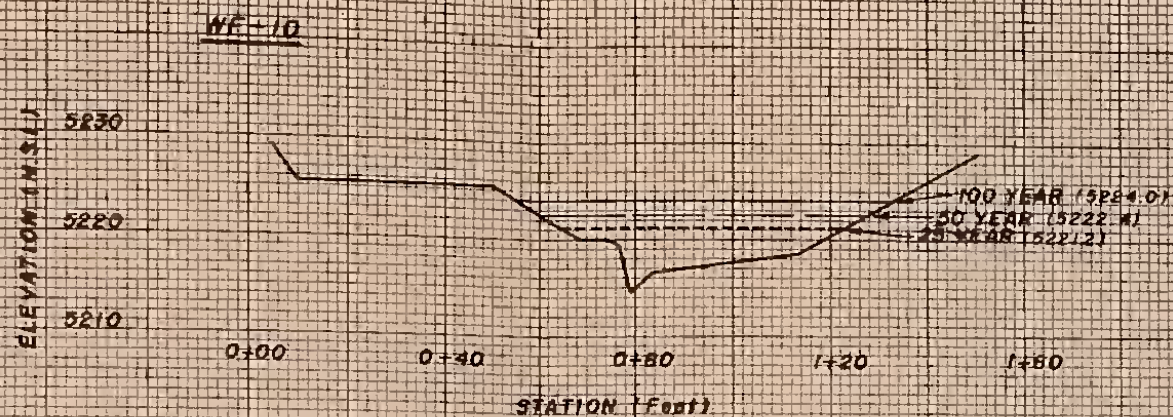
PLATE 16







VALLEY SECTIONS RAPID CREEK BANNOCK COUNTY, IDAHO U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Date _____ Designed _____ Drawn F.J.P. Traced _____ Checked _____	Approved by _____ Title _____ Title _____ No. 1 of 2



Valley sections plotted as viewed
looking downstream

**VALLEY SECTIONS
RAPID CREEK & TRIBUTARIES
BANNOCK COUNTY, IDAHO
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE**

Designed.....	Date.....	Approved by.....
Drawn <u>FJP</u>	<u>3-74</u>	Title.....
Traced.....	Sheet No <u>2</u>	Drawing No.....
Checked.....	of <u>2</u>	

APPENDIX A

LEGAL REFERENCE



APPENDIX A-1

EXECUTIVE ORDER 11296

Executive Order 11296 is reproduced here in its entirety from the Federal Register, Vol. 31, No. 155, pp 10663-4--Thursday, August 11, 1966:

Title 3--THE PRESIDENT

Executive Order 11296

Evaluation of Flood Hazard in Locating Federally Owned or Financed Buildings, Roads, and Other Facilities, and in Disposing of Federal Lands and Properties

WHEREAS uneconomic uses of the Nation's flood plains are occurring and potential flood losses are increasing despite substantial efforts to control floods; and

WHEREAS national and regional studies of areas and property subject to flooding indicate a further increase in flood damage potential and flood losses, even with continuing investment in flood protection structures; and

WHEREAS the Federal Government has extensive and continuing programs for the construction of buildings, roads, and other facilities and annually disposes of thousands of acres of Federal lands in flood hazard areas, all of which activities significantly influence patterns of commercial, residential, and industrial development; and

WHEREAS the availability of Federal loans and mortgage insurance and land use planning programs are determining factors in the utilization of lands:

NOW, THEREFORE, by virtue of the authority vested in me as President of the United States, it is hereby ordered as follows:

SECTION 1. The heads of the executive agencies shall provide leadership in encouraging a broad and unified effort to prevent uneconomic uses and development of the Nation's flood plains and, in particular, to lessen the risk of flood losses in connection with Federal lands and installations and federally financed or supported improvements. Specifically:

(1) All executive agencies directly responsible for the construction of Federal buildings, structures, roads, or other facilities shall evaluate flood hazards when planning the location of new facilities and, as far as practicable, shall preclude the uneconomic, hazardous, or unnecessary use of flood plains in connection with such facilities. With respect to existing Federally owned properties which have suffered flood damage or which may be subject thereto, the responsible agency head shall require conspicuous delineation of past and probable flood heights so as to assist in creating public awareness of and knowledge about flood hazards. Whenever practical and economically feasible, flood proofing measures shall be applied to existing facilities in order to reduce flood damage potential.

(2) All executive agencies responsible for the administration of Federal grant, loan, or mortgage insurance programs involving the construction of buildings, structures, roads, or other facilities shall evaluate flood hazards in connection with such facilities and, in order to minimize the exposure of facilities to potential flood damage and the need for future Federal expenditures for flood protection and flood disaster relief, shall, as far as practicable, preclude the uneconomic, hazardous, or unnecessary use of flood plains in such connection.

(3) All executive agencies responsible for the disposal of Federal lands or properties shall evaluate flood hazards in connection with lands or properties proposed for disposal to non-Federal public instrumentalities or private interests and, as may be desirable in order to minimize future Federal expenditures for flood protection and flood disaster relief and as far as practicable, shall attach appropriate restrictions with respect to uses of the lands or properties by the purchaser and his successors and may withhold such lands or properties from disposal. In carrying out this paragraph, each executive agency may make appropriate allowance for any estimated loss in sales price resulting from the incorporation of use restrictions in the disposal documents.

(4) All executive agencies responsible for programs which entail land use planning shall take flood hazards into account when evaluating plans and shall encourage land use appropriate to the degree of hazard involved.

SEC. 2. As may be permitted by law, the head of each executive agency shall issue appropriate rules and regulations to govern the carrying out of the provisions of Section 1 of this order by his agency.

SEC. 3. Requests for flood hazard information may be addressed to the Secretary of the Army or, in the case of lands lying in the basin of the Tennessee River, to the Tennessee Valley Authority. The Secretary or the Tennessee Valley Authority shall provide such information as may be available, including requested guidance on flood proofing. The Department of Agriculture, Department of the Interior, Department of Commerce, Department of Housing and Urban Development, and Office of Emergency Planning, and any other executive agency which may have information and data relating to floods shall cooperate with the Secretary of the Army in providing such information and in developing procedures to process information requests.

SEC. 4. Any requests for appropriations for Federal construction of new buildings, structures, roads, or other facilities transmitted to the Bureau of the Budget by an executive agency shall be accompanied by a statement by the head of the agency on the findings of his agency's evaluation and consideration of flood hazards in the development of such requests.

SEC. 5. As used in this order, the term "executive agency" includes any department, establishment, corporation, or other organizational entity of the executive branch of the Government.

SEC. 6. The executive agencies shall proceed immediately to develop such procedures, regulations, and information as are provided for in, or may be necessary to carry out, the provisions of Sections 1, 2, and 3 of this order. In other respects this order shall take effect on January 1, 1967.

LYNDON B. JOHNSON

THE WHITE HOUSE
August 10, 1966

(F.R. Doc. 66-8838; Filed, Aug. 10, 1966; 12:14 p.m.)

National Flood Insurance Act of 1968 as Amended

Enacted by

HOUSING AND URBAN DEVELOPMENT ACT OF 1968

PUBLIC LAW 90-448

Approved August 1, 1968

and

HOUSING AND URBAN DEVELOPMENT ACT of 1969

PUBLIC LAW 91-152

Approved December 24, 1969



U.S. Department of Housing and Urban Development
Washington, D.C. 20410

(e) It is the further purpose of this title to (1) encourage State and local governments to make appropriate land use adjustments to constrict the development of land which is exposed to flood damage and minimize damage caused by flood losses, (2) guide the development of proposed future construction, where practicable, away from locations which are threatened by flood hazards, (3) encourage lending and credit institutions, as a matter of national policy, to assist in furthering the objectives of the flood insurance program, (4) assure that any Federal assistance provided under the program will be related closely to all flood-related programs and activities of the Federal Government, and (5) authorize continuing studies of flood hazards in order to provide for a constant reappraisal of the flood insurance program and its effect on land use requirements.

(f)¹ The Congress also finds that (1) the damage and loss which results from mudslides is related in cause and similar in effect to that which results directly from storms, deluges, overflowing waters, and other forms of flooding, and (2) the problems involved in providing protection against this damage and loss, and the possibilities for making such protection available through a Federal or federally sponsored program, are similar to those which exist in connection with efforts to provide protection against damage and loss caused by such other forms of flooding. It is therefore the further purpose of this title to make available, by means of the methods, procedures, and instrumentalities which are otherwise established or available under this title for purposes of the flood insurance program, protection against damage and loss resulting from mudslides that are caused by accumulations of water on or under the ground.

AMENDMENTS TO THE FEDERAL FLOOD INSURANCE ACT OF 1956

Sec. 1303.² (a) The second sentence of section 15 (e) of the Federal Flood Insurance Act of 1956 (79 Stat. 1078) is amended—

70 Stat. 1078.
42 USC 2414.

CHAPTER I—THE NATIONAL FLOOD INSURANCE PROGRAM

BASIC AUTHORITY

Sec. 1304. (a) To carry out the purposes of this title, the Secretary of Housing and Urban Development is authorized to establish and carry out a national flood insurance program which will enable interested persons to purchase insurance against loss resulting from physical damage to or loss of real property or personal property related thereto arising from any flood occurring in the United States.

(b) In carrying out the flood insurance program the Secretary shall, to the maximum extent practicable, encourage and arrange for—

(1) appropriate financial participation and risk sharing in the program by insurance companies and other insurers, and

(2) other appropriate participation, on other than a risk-sharing basis, by insurance companies and other insurers, insurance agents and brokers, and insurance adjustment organizations,

in accordance with the provisions of chapter II.

¹Sec. 409 (a), Housing and Urban Development Act of 1969, Public Law 91-152, approved December 24, 1969, 83 Stat. 379, 397, added subsection (f).

²Sec. 1303 repealed all of the Federal Flood Insurance Act of 1956 except section 15 (e) of that Act which authorized borrowings from the United States Treasury for flood insurance purposes (see sec. 15 (e), *infra*). See also section 1309, *infra*.

SCOPE OF PROGRAM AND PRIORITIES

Sec. 1305. (a) In carrying out the flood insurance program the Secretary shall afford a priority to making flood insurance available to cover residential properties which are designed for the occupancy of from one to four families and business properties which are owned or leased and operated by small business concerns.

(b) If on the basis of—

(1) studies and investigations undertaken and carried out and information received or exchanged under section 1307, and

(2) such other information as may be necessary, the Secretary determines that it would be feasible to extend the flood insurance program to cover other properties, he may take such action under this title as from time to time may be necessary in order to make flood insurance available to cover, on such basis as may be feasible, any types and classes of—

(A) other residential properties,

(B) other business properties,

(C) agricultural properties,

(D) properties occupied by private nonprofit organizations, and

(E) properties owned by State and local governments and agencies thereof,

and any such extensions of the program to any types and classes of these properties shall from time to time be prescribed in regulations.

(c) The Secretary shall make flood insurance available in only those States or areas (or subdivisions thereof) which he has determined have—

(1) evidenced a positive interest in securing flood insurance coverage under the flood insurance program, and

(2) given satisfactory assurance that by December 31, 1971, adequate³ land use and control measures will have been adopted for the State or area (or subdivision) which are consistent with the comprehensive criteria for land management and use developed under section 1361, and that the application and enforcement of such measures will commence as soon as technical information on floodways and on controlling flood elevations is available.

82 Stat. 574,
42 USC 4012.

NATURE AND LIMITATION OF INSURANCE COVERAGE

Sec. 1306. (a) The Secretary shall from time to time, after consultation with the advisory committee authorized under section 1318, appropriate representatives of the pool formed or otherwise created under section 1331, and appropriate representatives of the insurance authorities of the respective States, provide by regulation for general terms and conditions of insurability which shall be applicable to properties eligible for flood insurance coverage under section 1305, including—

(1) the types, classes, and locations of any such properties which shall be eligible for flood insurance;

(2) the nature and limits of loss or damage in any areas (or subdivisions thereof) which may be covered by such insurance;

(3) the classification, limitation, and rejection of any risks which may be advisable;

(4) appropriate minimum premiums;

³Sec. 410 (a), Housing and Urban Development Act of 1969, Public Law 91-152, approved December 24, 1969, 83 Stat. 379, 397, substituted "December 31, 1971, adequate" for "June 30, 1970, permanent".

CHAPTER III—COORDINATION OF FLOOD INSURANCE WITH LAND-MANAGEMENT PROGRAMS IN FLOOD- PRONE AREAS

IDENTIFICATION OF FLOOD-PRONE AREAS

Sec. 1360. The Secretary is authorized to consult with, receive information from, and enter into any agreements or other arrangements with the Secretaries of the Army, the Interior, Agriculture, and Commerce, the Tennessee Valley Authority, and the heads of other Federal departments or agencies, on a reimbursement basis, or with the head of any State or local agency, or enter into contracts with any persons or private firms, in order that he may—

Contract
authority.

(1) identify and publish information with respect to all flood plain areas, including coastal areas located in the United States, which have special flood hazards, within five years following the date of the enactment of this Act, and

Publication
of information.

(2) establish flood-risk zones in all such areas, and make estimates with respect to the rates of probable flood-caused loss for the various flood-risk zones for each of these areas, within fifteen years following such date.

Flood-risk
zones.

CRITERIA FOR LAND MANAGEMENT AND USE

Sec. 1361. (a) The secretary is authorized to carry out studies and investigations, utilizing to the maximum extent practicable the existing facilities and services of other Federal departments or agencies, and State and local governmental agencies, and any other organizations, with respect to the adequacy of State and local measures in flood-prone areas as to land management and use, flood control, flood zoning, and flood damage prevention, and may enter into any contracts, agreements, or other appropriate arrangements to carry out such authority.

(b) Such studies and investigations shall include, but not be limited to, laws, regulations, or ordinances relating to encroachments and obstructions on stream channels and floodways, the orderly development and use of flood plains of rivers or streams, floodway encroachment lines, and flood plain zoning, building codes, building permits, and subdivision or other building restrictions.

(c) On the basis of such studies and investigations, and such other information as he deems necessary, the Secretary shall from time to time develop comprehensive criteria designed to encourage, where necessary, the adoption of adequate⁷ State and local measures which, to the maximum extent feasible, will—

82 Stat. 587.
42 USC 4102.

(1) constrict the development of land which is exposed to flood damage where appropriate,

(2) guide the development of proposed construction away from locations which are threatened by flood hazards,

(3) assist in reducing damage caused by floods, and

(4) otherwise improve the long-range land management and use of flood-prone areas, and he shall work closely with and provide any necessary technical assistance to State, interstate, and local governmental agencies, to encourage the application of such criteria and the adoption and enforcement of such measures.

⁷Sec. 410 (c), Housing and Urban Development Act of 1969, Public Law 91-152, approved December 24, 1969, 83 Stat. 379, 397, substituted "adequate" for "permanent".

PURCHASE OF CERTAIN INSURED PROPERTIES

Sec. 1362. The Secretary may, when he determines that the public interest would be served thereby, enter into negotiations with any owner of real property or interest therein which—

(1) was located in any flood-risk area, as determined by the Secretary,

(2) was covered by flood insurance under the flood insurance program authorized under this title, and

(3) was damaged substantially beyond repair by flood while so covered,

and may purchase such property or interests therein, for subsequent transfer, by sale, lease, donation, or otherwise, to any State or local agency which enters into an agreement with the Secretary that such property shall, for a period not less than forty years following transfer, be used for only such purposes as the Secretary may, by regulation, determine to be consistent with sound land management and use in such area.

CHAPTER IV—APPROPRIATIONS AND MISCELLANEOUS PROVISIONS

DEFINITIONS

82 Stat. 588.
42 USC 4121.

Sec. 1370. (a) As used in this title—

(1) the term “flood” shall have such meaning as may be prescribed in regulations of the Secretary, and may include inundation from rising waters or from the overflow of streams, rivers, or other bodies of water, or from tidal surges, abnormally high tidal water, tidal waves, tsunamis, hurricanes, or other severe storms or deluge;

(2) the terms “United States” (when used in a geographic sense) and “State” includes the several States, the District of Columbia, the territories and possessions, the Commonwealth of Puerto Rico, and the Trust Territory of the Pacific Islands;

(3) the terms “insurance company”, “other insurer” and “insurance agent or broker” include any organizations and persons authorized to engage in the insurance business under the laws of any State;

(4) the term “insurance adjustment organization” includes any organizations and persons engaged in the business of adjusting loss claims arising under insurance policies issued by any insurance company or other insurer;

(5) the term “person” includes any individual or group of individuals, corporation, partnership, association, or any other organized group of persons, including State and local governments and agencies thereof; and

(6) the term “Secretary” means the Secretary of Housing and Urban Development.

“Flood.” (b)⁸ The term “flood” shall also include inundation from mudslides which are caused by accumulations of water on or under the ground; and all of the provisions of this title shall apply with respect to such mudslides in the same manner and to the same extent as with respect to floods described in paragraph (1), subject to and in accordance

⁸Sec. 409 (b), Housing and Urban Development Act of 1969, Public Law 91-152, approved December 24, 1969, 83 Stat. 379, 397, added subsection (b).

APPENDIX B

BENCH MARK DOCUMENTATION



APPENDIX B

LIST OF BENCH MARKS USED OR ESTABLISHED IN FIELD SURVEYS

U.S. Coast and Geodetic Survey Bench Marks:

Bench Mark No. 15 E 1936

Elevation 4733.497

Description:

Inkom, 2.2 miles north of along Rapid Creek Road, where road reaches top of small bench; 37 feet east of center of road, 30 feet south of fence corner and 10 feet east of fenceline; set in top of concrete post projecting 0.2 foot above ground; a standard tablet stamped "15 E 1936".

Bench Mark No. 14 E 1936

Elevation 4915.88

Description:

Inkom, 4.1 miles north of along Rapid Creek Road, at small curve in road; 300 feet south of creek crossing, 33 feet west of road, 13 feet north of fence corner and 5 feet west of fenceline; set in top of concrete post projecting 1.0 foot above ground; a standard tablet stamped "14 E 1936".

Bench Mark No. 11 E 1936

Elevation 5463.495

Description:

Inkom, 9.6 miles north of along Rapid Creek Road; approximately 0.2 mile northwest of McKee Road fork, 37 feet north of centerline of road at angle in old fenceline; on concrete post, projecting 0.8 foot above ground; a standard tablet stamped "11 E 1936".

TBM (Temporary Bench Marks) established by Soil Conservation Service during survey for this study:

<u>TBM, Map Ref.No.</u>	<u>MSL ^{1/} Elevation</u>	<u>Description</u>
1	4524.66	Chipped square on west end of south bridge guard; SE 1/4, SW 1/4, Sec. 21, T7S, R36E
2	4602.82	Orange painted spot on concrete block located at NW corner of bridge; SW 1/4, NW 1/4, Sec. 22, T7S, R36E
3	4620.15	Orange painted spot on SW corner of concrete bridge guard; SW 1/4, NE 1/4, Sec. 22, T7S, R36E
4	4764.97	Orange painted spot on SW corner of concrete bridge guard; NW 1/4, NW 1/4, Sec. 14, T7S, R36E
5	4912.75	Orange painted spot on the NE wingwall on concrete facing; SE 1/4, SW 1/4, Sec. 2, T7S, R36E
6	5060.38	Orange painted spot on NW wingwall of upstream facing; SW 1/4, SE 1/4, Sec. 34, T6S, R36E

^{1/} Mean Sea Level (MSL)

